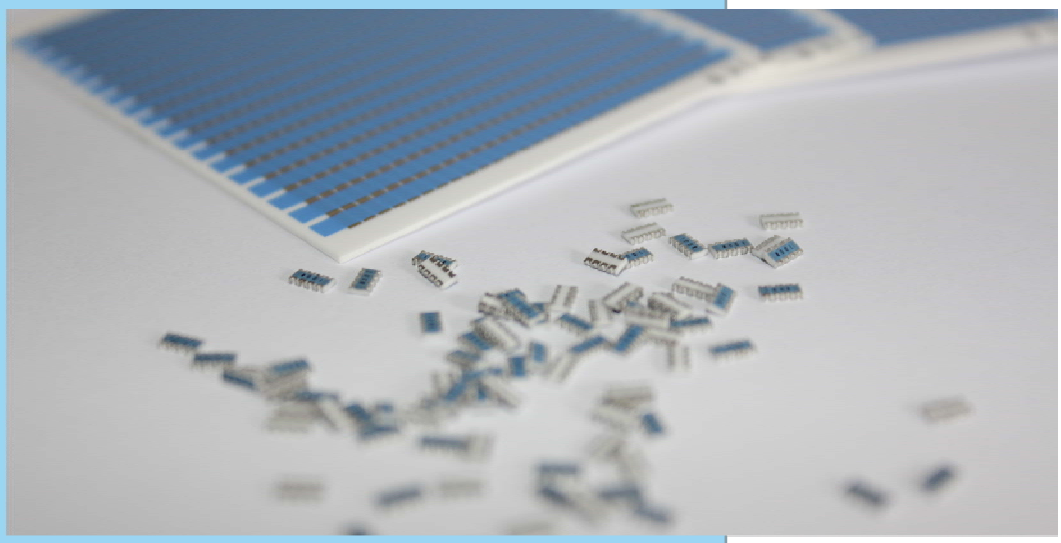
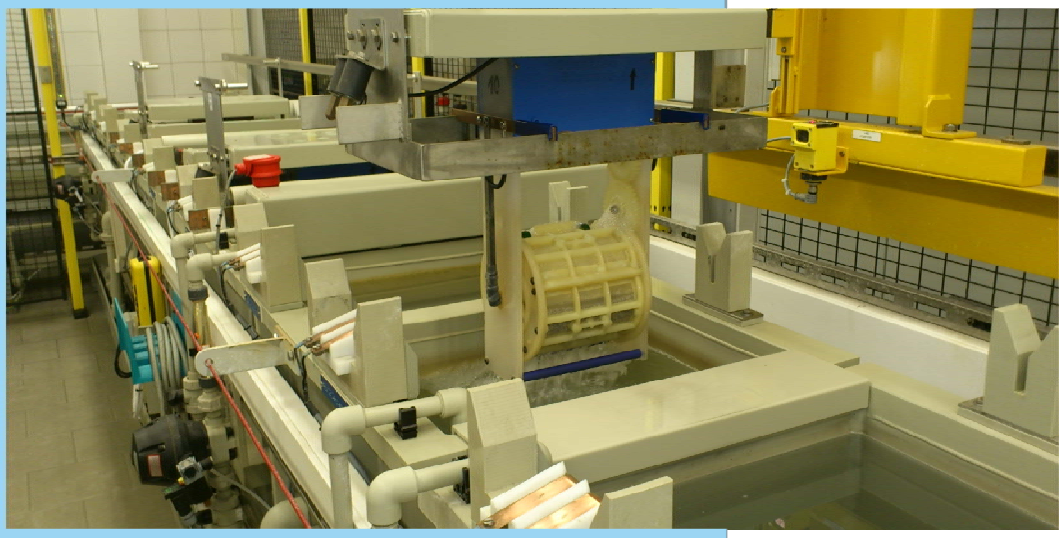
microtech gmbh

Your partner for

Chip resistors
Networks
Sensors





microtech GmbH electronic Catalog

Content:

microtech GmbH electronic is an European manufacturer of SMD chip resistors and SMD resistor networks. In addition to numerous custom components, SMD platinum temperature sensors (PT's) are also inside the offered product portfolio. We produce all the components at the German traditional site for passive components - in Teltow - just a few meters south of the German capital Berlin.

The company was founded in October 1990 and delivers in excellent logistics and product quality to both international corporations as well as medium-sized companies of demanding industrial and medical, aerospace and automotive electronics.

microtech GmbH electronic manufactures thick-film and thin-film technology and delivers its quality products such as precision, high-or low-resistance, trimmable and pulse-resistant flat chip resistors, resistor networks and SMD temperature sensors for different applications to Europe and the whole world.

Short decision processes resulting from the flat hierarchy structure of the family-run company are leading to fast and flexible responses to customer needs. Because of the efficiency of our processes, our customers are always impressed of our short standard delivery times.

The guidelines of our daily work, we have summarized in three customer-oriented assumptions and thus underlines our very high customer orientation and professionalism.

Test us and use
the possibilities of your manufacturer
in the heart of Europe.

Test us and take the advantage of our expertise in the heart of Europe. Our sales team will advise you objectively, competently and directly. The market supply on distributions in addition to direct sales is a key component of our comprehensive marketing organization.

Your sales contact:

http://www.microtech-teltow.de
vertrieb@microtech-teltow.de

Phone: +49 (0) 3328 30 824 -11 / -18 / -19 / -34
Fax: +49 (0) 3328 30 824 -30

@Facebook @Xing

Production program / Linecard
Thin film (Metal film)

Thin film series								CMF
		Precision application		Professional application				
Type	**Size**	**U_{max} (V)**	**P_{70} (W)**	**U_{max} (V)**	**P_{70} [3] (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
CMF	0402	12,50	0,016	50	0,063	100R – 47k0	0,1 / 0,25 / 0,5 / 1	15 [5]
						100R – 221k	0,1 / 0,25 / 0,5 / 1	25
						100R – 511k	0,1 / 0,25 / 0,5 / 1	50
						10R0 – 1M00	1	50
CMF	0603	25,00	0,032	75	0,100	100R – 332k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]
						10R0 – 511k [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25
						1R00 – 1M50 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	0805	35,00	0,050	150	0,125	100R – 511k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]
						10R0 – 1M00 [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25
						1R00 – 2M00 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	1206	50,00	0,100	200	0,250	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 [4]
						35R0 – 1M00 [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	15
						10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25
						1R00 – 4M70 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	1210	50,00	0,100	200	0,500	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]
CMF	2010	100,00	0,150	300	0,500	10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25
CMF	2512	100,00	0,250	500	1,000	10R0 – 4M70 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMF	1218	50,00	0,300	200	1,000	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]
						10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25 / 50

[1] 10R – 100R from ± 0,1% tolerance [2] 1R – 10R from ± 0,5% tolerance [3] For continuous operation sufficient heat dissipation must be ensured
[4] TCR ± 5 on request [5] TCR ± 10 on request [6] > 1M from ± 0,1% tolerance

Thin film series – Power variant						CMP
Type	**Size**	**U_{max} (V)**	**P_{70} [3] (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
CMP	0402	50	0,100	100R – 47k0	0,1 / 0,25 / 0,5 / 1	15 [5]
				100R – 221k	0,1 / 0,25 / 0,5 / 1	25
				100R – 511k	0,1 / 0,25 / 0,5 / 1	50
				10R0 – 1M00	1	50
CMP	0603	75	0,125	100R – 332k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]
				10R0 – 511k [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25
				1R00 – 1M50 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMP	0805	150	0,200	100R – 511k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]
				10R0 – 1M00 [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25
				1R00 – 2M00 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50
CMP	1206	200	0,400	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]
				10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25
				1R00 – 4M70 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50

[1] 10R – 100R from ± 0,1% tolerance [2] 1R – 10R from ± 0,5% tolerance [3] For continuous operation sufficient heat dissipation must be ensured
[4] TCR ± 5 on request [5] TCR ± 10 on request [6] > 1M from ± 0,1% tolerance

Production program / Linecard
Thin film (Metal film)

Voltage proof thin film series						CMV
Type	**Size**	**U_{max} (V)**	**P_{70} (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
CMV	1206	300	0,250	100k – 4M70[1)]	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 25 / 50
CMV	2512	1000	1,000	100k – 4M70[1)]	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 25 / 50

[1)] > 1M from ± 0,1% tolerance

Networks with circuit variants						CMA
Type	**Size**	**U_{max} (V)**	**P_{70} (W)**	**R-Range with circuit variants (R_1=R_2=R_3=R_4 / R_1=R_4 ; R_2=R_3)**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
CMA	1206-4	50	0,063 per element	100R – 25k	0,25 / 0,5 / 1	25 / 50

Jumper in thin film technology	Jumper
For all sizes we offer jumpers (0R).	max. 0R020

Platinum-Chip-Temperature sensors					CPT
Type	**Size**		**R-Range**	**Class**	**TCR (ppm/K)**
CPT	0805 / 1206		100R, 500R,1k	F0,1 / F0,15 / F0,3	3850

Contact variants available for all types	**Sign**	**Characteristics**
Lead-free standard contact	CMF	Electroplated pure tin contact
Epoxy bondable contact	CMF-K	Tin-free sputtered contact for mounting with conductive adhesive
Non magnetic contact	CMF-N	Contact without electroplated Ni-Barrier (low rest permeability), suitable only for reflow soldering method

Ordering information								
CMF	**- N**	**0603**	**10k**	**0,1%**	**10ppm/K**	**K**	**P**	**5** (optional)
Typ	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CMF	Standard (without add.) -N (non magnetic) -K (epoxy bondable)	0402 to 2512	1R to 4M7	0,05 0,1 0,25 0,5 1	10 15 25 50	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Thin film series

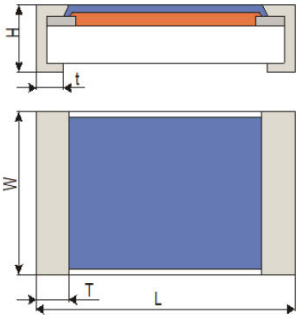
Type: CMF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thin film technology
- High-precision resistor layers
- Resistance area coated with surface passivation
- Highest stability and reliability
- Very tight tolerances (≥0,05%) - low temperature coefficient (≥10ppm/K)
- Low current noise, good pulse strength
- R-Value-Matching available
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Order quantities from 1000 pieces for <1% and <TCR 50 available by extra charge
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact -K

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CMF	- N	0603	10k	0,1%	10ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CMF	Standard (without add.) -N (non magnetic) -K (epoxy bondable)	0402 . to . 2512	1R . to . 4M7	0,05 0,1 0,25 0,5 1	10 15 25 50	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Thin film series

Type: CMF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

	Precision application		Professional application							
Size	**U_{max} (V)**	**P_{70} (W)**	**U_{max} (V)**	**P_{70} [3] (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**	**Packaging**		
								P	**B**	**S**
0402	12,5	0,016	50	0,063	100R – 47k0	0,1 / 0,25 / 0,5 / 1	15 [5]	x		x
					100R – 221k	0,1 / 0,25 / 0,5 / 1	25	x		x
					100R – 511k	0,1 / 0,25 / 0,5 / 1	50	x		x
					10R0 – 1M00	1	50	x		x
0603	25,0	0,032	75	0,100	100R – 332k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]	x		x
					10R0 – 511k [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25	x		x
					1R00 – 1M50 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50	x		x
0805	35,0	0,050	150	0,125	100R – 511k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]	x		x
					10R0 – 1M00 [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25	x		x
					1R00 – 2M00 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50	x		x
1206	50,0	0,100	200	0,250	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 [4]	x		x
					35R0 – 1M00 [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	15	x		x
					10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25	x		x
					1R00 – 4M70 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50	x		x
1210	50,0	0,100	200	0,500	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]	x		x
2010	100,0	0,150	300	0,500	10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25		x	x
2512	100,0	0,250	500	1,000	10R0 – 4M70 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50		x	x
1218	50,0	0,300	200	1,000	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]		x	x
					10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25 / 50		x	x

[1] 10R – 100R from ± 0,1% tolerance [2] 1R – 10R from ± 0,5% tolerance [3] For continuous operation sufficient heat dissipation must be ensured

[4] TCR ± 5 on request [5] TCR ± 10 on request [6] > 1M from ± 0,1% tolerance

Technical data - general:

Technical data	Precision application	Professional application
Operating temperature range	-10°C … +85°C	-55°C … +155°C
Climatic category acc. EN 60068	10 / 85 / 56	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	± (0,05% +0,01R) at 260°C 10s	± (0,05% +0,01R) at 260°C 10s
Long time stability		
Storage 85°C / 155°C / 1000 h	± (0,1% +0,02R)	± (0,25% +0,05R)
Endurance P_{70} / 70°C / 1000 h	± (0,1% +0,02R)	± (0,25% +0,05R)
Endurance P_{70} / 70°C / 8000 h	± (0,25% +0,02R)	± (0,5% +0,05R)
Endurance P_{70} / 70°C / 225000 h [1]	± (1,0% +0,02R)	± (1,5% +0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (0,1% +0,02R)	± (0,25% +0,05R)

[1] calculated acc. Arrhenius

Data, unless specified, acc. EN 140401-801.

Thin film series – Power variant

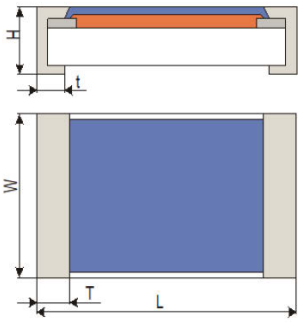
Type: CMP
Sizes: 0402, 0603, 0805, 1206

Characteristics:

- Chip resistors in thin film technology
- High-precision resistor layers
- Resistance area coated with surface passivation
- Highest stability and reliability
- Very tight tolerances (≥0,05%) - low temperature coefficient (≥10ppm/K)
- Low current noise, good pulse strength
- R-Value-Matching available
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Order quantities from 1000 pieces for <1% and <TCR 50 available by extra charge
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact -K

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75



Packaging units:

Reel Ø	Card tape acc. EN 60286-3
180 mm	5 T pcs. 10 T pcs. for size 0402
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

CMP	- N	0603	10k	0,1%	10ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CMP	Standard (without add.) -N (non magnetic)	0402 . to . 1206	1R . to . 4M7	0,05 0,1 0,25 0,5 1	10 15 25 50	K- with (from size 0603) N- without (only size 0402)	P- Card tape S- Bulk	Depends on size and packaging unit

Thin film series – Power variant

Type: CMP
Sizes: 0402, 0603, 0805, 1206

Technical data – depending on size:

Type	U_{max} (V)	P_{70} [3] (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,100	100R – 47k0	0,1 / 0,25 / 0,5 / 1	15 [5]	x		x
			100R – 221k	0,1 / 0,25 / 0,5 / 1	25	x		x
			100R – 511k	0,1 / 0,25 / 0,5 / 1	50	x		x
			10R0 – 1M00	1	50	x		x
0603	75	0,125	100R – 332k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]	x		x
			10R0 – 511k [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25	x		x
			1R00 – 1M50 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50	x		x
0805	150	0,200	100R – 511k	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]	x		x
			10R0 – 1M00 [1]	0,05 / 0,1 / 0,25 / 0,5 / 1	25	x		x
			1R00 – 2M00 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50	x		x
1206	200	0,400	100R – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10 / 15 [4]	x		x
			10R0 – 2M00 [1] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	25	x		x
			1R00 – 4M70 [1] [2] [6]	0,05 / 0,1 / 0,25 / 0,5 / 1	50	x		x

[1] 10R – 100R from ± 0,1% tolerance [2] 1R – 10R from ± 0,5% tolerance [3] For continuous operation sufficient heat dissipation must be ensured

[4] TCR ± 5 on request [5] TCR ± 10 on request [6] > 1M from ± 0,1% tolerance

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	± (0,05% +0,01R) at 260°C 10s
Long time stability	
Storage 155°C / 1000 h	± (0,5% +0,05R)
Endurance P_{70} / 70°C / 1000 h	± (0,5% +0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (0,5% +0,05R)

Data, unless specified, acc. EN 140401-801.

Voltage proof thin film series

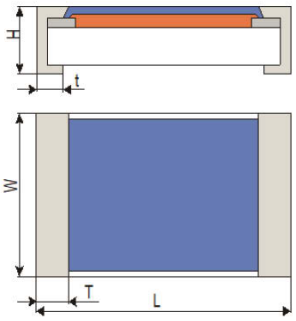
Type: CMV
Sizes: 1206, 2512

Characteristics:

- Chip resistors in thin film technology with higher voltage resistance
- High-precision resistor layers
- Resistance area coated with surface passivation
- Highest stability and reliability
- Very tight tolerances (≥0,05%) - low temperature coefficient (≥10ppm/K)
- Low current noise, good pulse strength
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Order quantities from 1000 pieces for <1% and <TCR 50 available by extra charge
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact -K

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs.	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CMV	**- N**	**1206**	**500k**	**0,5%**	**25ppm/K**	**K**	**P**	**10** (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CMV	-Standard (without add.) -N (non magnetic) -K (epoxy bondable)	1206 2512	100k . to . 4M7	0,05 0,1 0,25 0,5 1	10 25 50	K- only with	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Voltage proof thin film series

Type: CMV
Sizes: 1206, 2512

Technical data – depending on size:

Size	U_{max} (V)	P_{70} [1] (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
1206	300	0,25	100k – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10	x		x
			1M00– 2M00 [2]	0,05 / 0,1 / 0,25 / 0,5 / 1	25	x		x
			100k – 4M70 [2]	0,05 / 0,1 / 0,25 / 0,5 / 1	50	x		x
2512	1000	1	100k – 1M00	0,05 / 0,1 / 0,25 / 0,5 / 1	10		x	x
			1M00 – 2M00 [2]	0,05 / 0,1 / 0,25 / 0,5 / 1	25		x	x
			100k – 4M70 [2]	0,05 / 0,1 / 0,25 / 0,5 / 1	50		x	x

[1] For continuous operation sufficient heat dissipation must be ensured

[2] > 1M from ± 0,1% tolerance

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	± (0,05% +0,01R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (0,25% +0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,25% +0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (0,25% +0,05R)

Data, unless specified, acc. EN 140401-801.

Networks - Thin film series

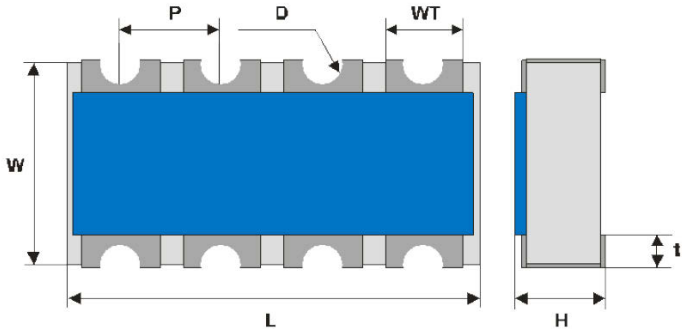
Type: CMA
Sizes: 1206-4 (4 x 0603)

Characteristics:

- Chip resistors in thin film technology
- Four isolated resistors with 2 circuit variants
- Concave contact
- Resistance area coated with surface passivation
- High stability and reliability
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact -K

Dimensions (in mm):

L Length	**W** Width	**H** Depth	**t** Contact back	**WT** Contact width	**P** Contact spacing	**D** Contact radius
3,2 ± 0,10	1,6 ± 0,10	0,6 ± 0,10	0,3 ± 0,10	0,5 ± 0,10	0,8	0,3



Packaging units:

Reel **Ø**	**Card tape** acc. EN 60286-3
180 mm	5 T pcs.
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

Circuit type 1								
CMA	**-N**	**1206-4**	**4k7**	**1%**	**50ppm/K**	**N**	**P**	**10** (optional)
Type	Contact	Size	R-Value R1;R2;R3;R4	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CMA	-Standard (without add.) -N (non magnetic) -K (epoxy bondable)	1206-4	100R to 25k	0,25 0,5 1	25 50	N- only without	P- Card tape S- Bulk	5 10 20

Networks - Thin film series

Type: CMA
Sizes: 1206-4 (4 x 0603)

Ordering information:

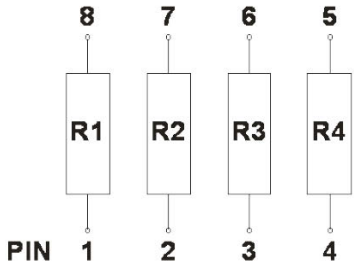
Circuit type 2									
CMA	**-N**	**1206-4**	**4k7**	**6k8**	**1%**	**50ppm/K**	**N**	**P**	**10** (optional)
Type	Contact	Size	R-Value R1;R4	R-Value R2;R3	± Tolerance	± TCR	Marking	Packaging	pcs./Reel (T pcs.)
CMA	-Standard (without add.) -N (non magnetic) -K (epoxy bondable)	1206-4	100R to 25k	100R to 25k	0,25 0,5 1	25 50	N- only without	P- Card tape S- Bulk	5 10 20

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	Absolute R-Tolerance (± %)	Matching R-Tolerance (± %)	Absolute TCR (± ppm/K)	Tracking TCR (± ppm/K)	Packaging		
								P	B	S
1206-4	50	4 x 0,063	100R – 25k	± 0.25	0,1	± 25	25	x		x
1206-4	50	4 x 0,063	100R – 25k	± 0.5	0,25	± 25	25	x		x
1206-4	50	4 x 0,063	100R – 25k	± 1.0	0,5	± 25	25	x		x
1206-4	50	4 x 0,063	100R – 25k	± 0.25	0,1	± 50	50	x		x
1206-4	50	4 x 0,063	100R – 25k	± 0.5	0,5	± 50	50	x		x
1206-4	50	4 x 0,063	100R – 25k	± 1,0	0,5	± 50	50	x		x

Circuit type:

Type	CMA 1206-4
1	R1=R2=R3=R4
2	R1=R4 ; R2=R3
Ratio R_{min}/R_{max} on request	



Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,1% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (0,5% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,25% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (0,25% + 0,05R)

Data, unless specified, acc. EN 140401-801.

Jumper in thin film technology

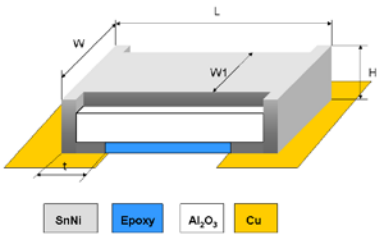
Type: CMF-Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thin film technology
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Customer specific barcodes available - also in 2D
- Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		W1 Width		H Depth		t Contact back	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,25	0,40	0,10	0,35
0603	1,50	1,70	0,75	0,95	0,50	0,70	0,35	0,55	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,80	1,10	0,35	0,65	0,15	0,60
1206	2,90	3,35	1,45	1,75	1,00	1,30	0,35	0,65	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CMF		0805	0R	N	P	5 (optional)
Type	Contact	Size	R-Value	Marking	Packaging	pcs. / Reel (T pcs.)
CMF	Standard (without add.)	0402 to 2512	0R	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Jumper in thin film technology

Type: CMF-Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Max. current I_{max} (A)	Max. R-Value R_{max} (mOhm)	Insulation voltage U_{ins} (V) 1 min	Insulation voltage U_{ins} (V) Continuous	Packaging P	Packaging B	Packaging S
0402	1,5	20	75	75	x		x
0603	2,00	20	100	75	x		x
0805	2,50	20	200	75	x		x
1206	3,50	20	300	75	x		x
1210	4,00	20	300	75	x		x
1218	7,00	20	300	75		x	x
2010	5,00	20	300	75		x	x
2512	7,00	20	300	75		x	x

Technical data - general:

Technical data	
Operating temperature range	-55°C ... +155°C
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	260°C 10s

Data, unless specified, acc. EN 140401-801.

Platinum-Chip-Temperature sensors acc. DIN EN 60 751

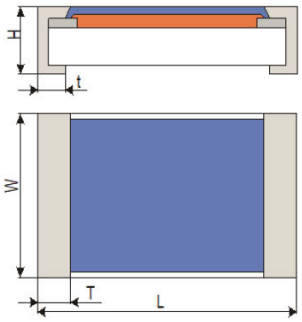
Type: CPT
Sizes: 0805, 1206

Characteristics:

- Temperature sensors in thin film technology
- Wide area of temperature measurement from -50 to +150°C
- Standardized nominal values and tolerances
- Tolerance classes 1/3 DIN B, DIN A, DIN B (F0,1, F0,15, F0,3)
- High measurement accuracy and good long time stability
- Good linear characteristic curves
- Varnish passivation
- Galvanic wrap-around contact with diffusion barrier
- Suitable for automatic large-scale production
- Tape packaging acc. DIN IEC 286-3
- RoHS-conform

Dimensions (in mm):

Size	L Length	W Width	H Depth	T/t Contact
0805	2,00±0,2	1,30±0,2	0,50±0,2	0,40±0,2
1206	3,10±0,2	1,50±0,2	0,80±0,2	0,63±0,2



Packaging units:

Reel Ø	Card tape acc. EN 60286-3
180 mm	5 T pcs.
Only with original packing (5.000 pieces) in the belt on roll with roll forward and roll after-run. For small quantities, this may differ.	

Ordering information:

CPT	0805	1k	B	K	P	5 (optional)
Type	Size	R-Value	Class	Marking	Packaging	pcs. / Reel (T pcs.)
CPT	0805 1206	100R 500R 1k	Temperature range: 1/3 DIN B (class F0,1) DIN A (class F0,15) DIN B (class F0,3)	K- only with	P- Card tape	

Size	R-Value	Availability		
		1/3 Din B	DIN A	DIN B
0805	100	on request	on request	X
	500	on request	on request	X
	1000	on request	on request	X
1206	100	on request	on request	X
	500	on request	on request	X
	1000	on request	on request	X

Platinum-Chip-Temperature sensors acc. DIN EN 60 751

Type: CPT
Sizes: 0805, 1206

Technical data:

Nominal R-Values:	100 Ohm, 500 Ohm, 1000 Ohm at 0°C
Temperature coefficient:	α = 3,850 x 10^{-3}/°C (between 0 and 100°C)
Temperature range:	-50 ... +150°C
Tolerance:	Temperature range 1/3 DIN B (F0,1): 0 to +150°C Temperature range DIN A (F0,15): -30 to +150°C Temperature range DIN B (F0,3): -50 to +150°C
Measurement current:	Pt 100 1,0mA recommended Pt 500 0,7mA recommended Pt 1000 0,1mA recommended
Maximum current:	Pt 100 7,0mA Pt 500 3,0mA Pt 1000 1,0mA
Long time stability:	max. R_0-Drifting ≤ 0,05% / Year
Insulation R-Value:	>10M at room temperature
Self-heating:	$\Delta t = I^2 * R * E$
Self-heating coefficient E in K/mW	Type in water (v=0,2 m/s) in air (v=2m/sec) 0805 0,02 0,15 1206 0,02 0,20
Response time in seconds	Type in water (v=0,4m/sec) in air (v=1m/sec) $t_{0,5}$ $t_{0,9}$ $t_{0,5}$ $t_{0,9}$ 0805 0,1 0,3 2,6 7,9 1206 0,1 0,3 3,3 9,5
Soldering connections:	Electroplated tinned wrap-around contact with diffusion barrier Solderability, see DIN IEC 68 Part 2
Processing:	Reflow soldering (Soldering temperature/time ≤ 240°C / 8s) Flood soldering (Soldering temperature/time ≤ 260°C / 10s)
SMD-Sizes:	The types CPT 0805 and CPT 1206 are produced acc. CECC 40401-004/DIN 45 921.
Operating conditions:	Platinum-Temperature sensors may not be used unprotected inside moist environments or inside aggressive atmospheres. It's necessary to perform a check by the user before using inside applications.
Packaging:	Card tape
Storage:	Inside tape packaging (standard), Platinum-Temperature sensors can be stored under normal environment conditions at least 12 month.

Testpoints

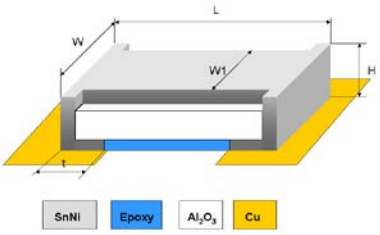
Type: CTP
Sizes: 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		W1 Width		H Depth		t Contact back	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0603	1,50	1,70	0,75	0,95	0,50	0,70	0,35	0,55	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,80	1,10	0,35	0,65	0,15	0,60
1206	2,90	3,35	1,45	1,75	1,00	1,30	0,35	0,65	0,25	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,35	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,35	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,35	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,35	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs.	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CTP	0805	P	5 (optional)
Type	Size	Packaging	pcs. / Reel (T pcs.)
CTP	0603 to 2512	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Testpoints

Type: CTP
Sizes: 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data:

This test points, as well as other SMD elements, can be automatically loaded and allow control measurements on the finished board. The contact surface is coated with a solid, electroplated SnNi layer.

Technical data - general:

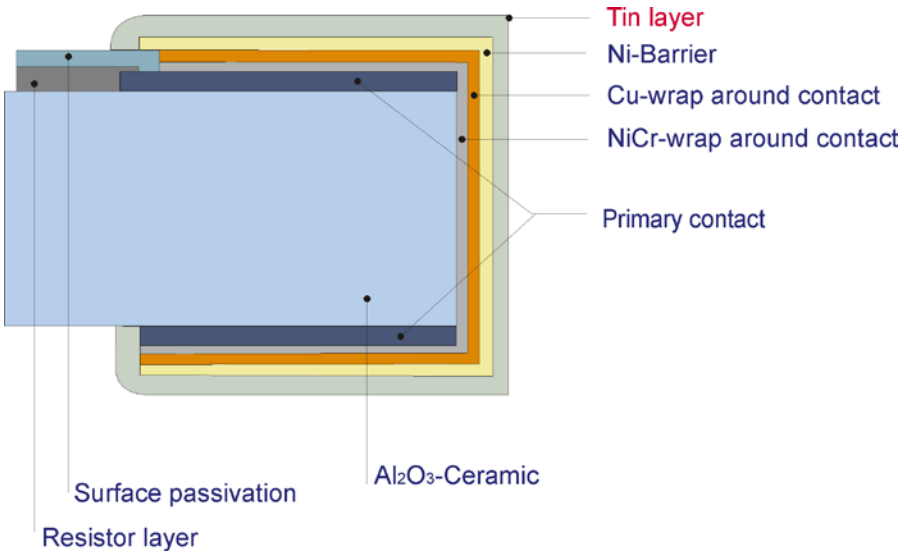
Technical data	
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	260°C 10s

Contact variants - Thin film

All components, depending on specifications, are produced to customer request in any of the following contact variants.

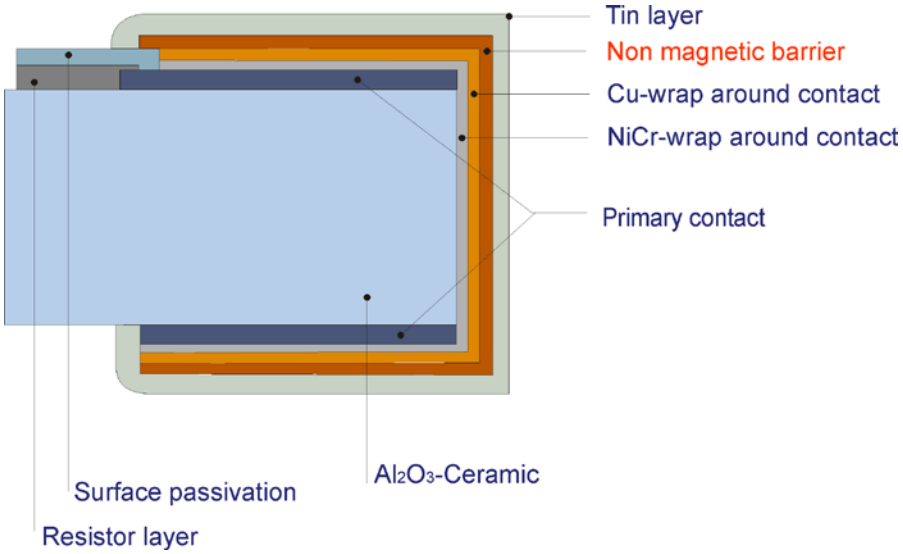
Lead-free galvanic standard contact:

- Electroplated pure tin contact



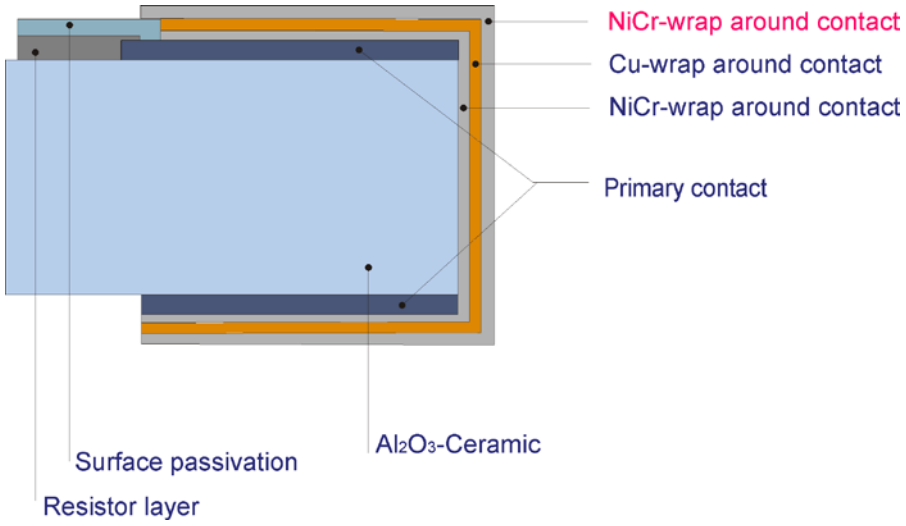
Non magnetic galvanic contact:

- Contact system without electroplated Ni-Barrier (low rest permeability)



Epoxy bondable contact:

- Tin-free sputtered contact for mounting with conductive adhesives



Production program / Linecard
Thick film

Thick film series - Standard						CDF
Type	**Size**	**U_{max} (V)**	**P_{70} [1] (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
CDF	0402	50	0,063	1R – 10M	1	50 / 100
CDF	0603	75	0,100	1R – 10M	0,5 / 1	50 / 100
CDF	0805	150	0,125	1R – 10M	0,5 / 1	50 / 100
CDF	1206	200	0,250	1R – 10M	0,5 / 1	50 / 100

High power series						CLF
CLF	1210	200	0,500	1R – 10M	0,5 / 1 / 5	50 / 100
CLF	1218	200	1,000	1R – 10M	0,5 / 1 / 5	50 / 100
CLF	2010	300	0,500	1R – 10M	0,5 / 1 / 5	50 / 100
CLF	2512	500	1,000	1R – 10M	0,5 / 1 / 5	50 / 100

Thick film series - Power variant						CDP
CDP	0402	50	0,100	1R – 10M	1	50 / 100
CDP	0603	75	0,125	1R – 10M	0,5 / 1	50 / 100
CDP	0805	150	0,200	1R – 10M	0,5 / 1	50 / 100
CDP	1206	200	0,400	1R – 10M	0,5 / 1	50 / 100

Low ohmic series						CNF
CNF	0402	$U = \sqrt{P*R}$	0,063	0R27 – 0R99	1 / 5 / 10	100
CNF	0603		0,100	0R05 – 0R27 0R27 – 0R99	5 / 10 1 / 5 / 10	500 100
CNF	0805		0,125			
CNF	1206		0,250			
CNF	1210		0,500			
CNF	2010		0,500			
CNF	2512		1,000			
CNF	1218		1,000	0R02 – 0R10 0R10 – 0R99	5 / 10 1 / 5 / 10	500 100

High ohmic series						CHF
CHF	0402	50	$P = \frac{U^2}{R}$	>10M – 1G [2]	from 1,0 (>330M from 5,0%)	100 / 250 (>500M TK 500)
CHF	0603	75		>10M – 1G [2]		
CHF	0805	150		>10M – 1G [2]		
CHF	1206 / 1210 / 1218	200		>10M – 1G [2]		
CHF	2010	300		>10M – 1G [2]		
CHF	2512	500		>10M – 1G [2]		

[1] For continuous operation sufficient heat dissipation must be ensured.

[2] Higher R-Values on request

Pulse proof series						CDI / CLI
CDI	0402	50	0,063	1R – 10M	5 / 10 / 20	50 / 100
CDI	0603	75	0,100	1R – 10M	5 / 10 / 20	50 / 100
CDI	0805	150	0,125	1R – 10M	5 / 10 / 20	50 / 100
CDI	1206	200	0,250	1R – 10M	5 / 10 / 20	50 / 100
CLI	1210	200	0,500	1R – 10M	5 / 10 / 20	50 / 100
CLI	1218	200	1,000	1R – 10M	5 / 10 / 20	50 / 100
CLI	2010	300	0,500	1R – 10M	5 / 10 / 20	50 / 100
CLI	2512	500	1,000	1R – 10M	5 / 10 / 20	50 / 100

Production program / Linecard
Thick film

Trimmable series						CRA
Type	**Size**	**U_{max} (V)**	**P_{70} (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
CRA	0402	50	0,063	1R – 10M	Tolerance acc. customer request up to ±30% (also variable)	50 / 100
CRA	0603	75	0,100	1R – 10M		50 / 100
CRA	0805	150	0,125	1R – 10M		50 / 100
CRA	1206	200	0,250	1R – 10M		50 / 100
CRA	1210	200	0,500	1R – 10M		50 / 100
CRA	1218	200	1,000	1R – 10M		50 / 100
CRA	2010	300	0,500	1R – 10M		50 / 100
CRA	2512	500	1,000	1R – 10M		50 / 100

Trimmable series with better visual recognition						CQA
CQA	0402	50	0,063	1R – 100R	Tolerance acc. customer request up to ±30% (also variable)	50 / 100
CQA	0603	75	0,100	1R – 100R		50 / 100
CQA	0805	150	0,125	1R – 100R		50 / 100
CQA	1206	200	0,250	1R – 100R		50 / 100
CQA	1210	200	0,500	1R – 100R		50 / 100
CQA	1218	200	1,000	1R – 100R		50 / 100
CQA	2010	300	0,500	1R – 100R		50 / 100
CQA	2512	500	1,000	1R – 100R		50 / 100

Networks						CNR
CNR	1206-4	50	0,063 per element	10R – 1M	1 / 5	50 / 100

Jumper in thick film technology	Jumper
For all sizes we offer jumpers (0R).	max. 0R020

Contact variants	Sign (e.g. for CDF)	Characteristics
Lead-free standard contact	CDF	Electroplated pure tin contact
Epoxy bondable contact	CDF-K	Tin-free sputtered contact for mounting with conductive adhesive
Non magnetic contact	CDF-N	Contact without electroplated Ni-Barrier (low rest permeability), suitable only for reflow soldering method
Corrosive gas resistant contact	CDF-S	Increased resistance against sulfonamide processes

Ordering information								
CDF	**- N**	**0603**	**10k**	**1%**	**50ppm/K**	**K**	**P**	**5** (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CDF	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive resistent)	0402 0603 0805 1206	1R to 10M	0,5 1,0	50 100	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Thick film series - Standard

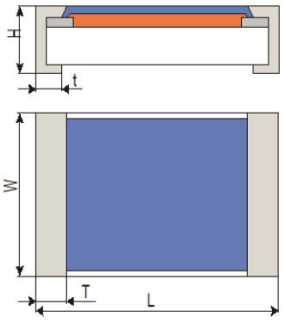
Type: CDF
Sizes: 0402, 0603, 0805, 1206

Characteristics:

- Chip resistors in thick film technology
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances (≥0,5%) – low temperature coefficient
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact –K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75



Packaging units:

Reel Ø	Card tape acc. EN 60286-3
180 mm	5 T pcs. 10 T pcs. for size 0402
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

CDF	- N	0603	10k	1%	50ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CDF	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	0402 0603 0805 1206	1R to 10M	0,5 1,0	50 100	K- with (from size 0603) N- without (only size 0402)	P- Card tape S- Bulk	Depends on size and packaging unit

Thick film series - Standard

Type: CDF
Sizes: 0402, 0603, 0805, 1206

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,063	1R - 10M	1,0	50 / 100	x		x
0603	75	0,100	1R - 10M	0,5 / 1,0	50 / 100	x		x
0805	150	0,125	1R - 10M	0,5 / 1,0	50 / 100	x		x
1206	200	0,250	1R - 10M	0,5 / 1,0	50 / 100	x		x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

High power series

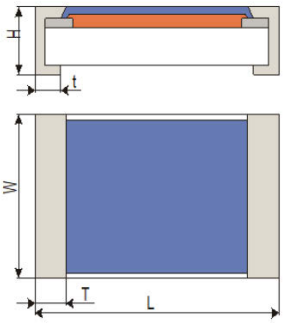
Type: CLF
Sizes: 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Special layout for high electrical load
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances (≥0,5%) – low temperature coefficient (≥50ppm/K)
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact -K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs.	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CLF	- N	1210	100k	1%	100ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CLF	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	1210 to 2512	1R to 10M	0,5 1 5	50 100	K- only with	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

High power series

Type: CLF
Sizes: 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
1210	200	0,50	1R - 10M	0,5 / 1 / 5	50 / 100	x		x
1218	200	1,00	1R - 10M	0,5 / 1 / 5	50 / 100		x	x
2010	300	0,50	1R - 10M	0,5 / 1 / 5	50 / 100		x	x
2512	500	1,00	1R - 10M	0,5 / 1 / 5	50 / 100		x	x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	±(1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

Thick film series – Power variant

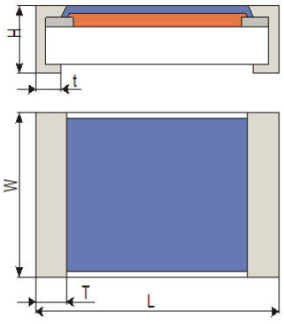
Type: CDP
Sizes: 0402, 0603, 0805, 1206

Characteristics:

- Chip resistors in thick film technology
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances (≥0,5%) – low temperature coefficient
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact -K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75



Packaging units:

Reel Ø	Card tape acc. EN 60286-3
180 mm	5 T pcs. 10 T pcs. for size 0402
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

CDP	- N	0603	10k	1%	50ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CDP	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	0402 0603 0805 1206	1R to 10M	0,5 1,0	50 100	K- with (from size 0603) N- without (only size 0402)	P- Card tape S- Bulk	Depends on size and packaging unit

Thick film series – Power variant

Type: CDP
Sizes: 0402, 0603, 0805, 1206

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,100	1R - 10M	1,0	50 / 100	x		x
0603	75	0,125	1R - 10M	0,5 / 1,0	50 / 100	x		x
0805	150	0,200	1R - 10M	0,5 / 1,0	50 / 100	x		x
1206	200	0,400	1R - 10M	0,5 / 1,0	50 / 100	x		x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (1,0% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

Low ohmic series

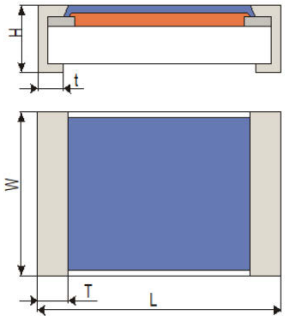
Type: CNF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Very low ohmic resistor layers
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CNF	- N	0603	0R15	5%	100ppm/K	N	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CNF	Standard (without add.) -N (non magnetic) -S (corrosive gas resistant)	0402 to 2512	0R02 to 0R99	1 5 10	100 500	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Low ohmic series

Type: CNF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	$U = \sqrt{P * R}$	0,063	0R27 – 0R99	1 / 5 / 10	100	x		x
0603		0,100	0R05 – 0R27	5 / 10	500	x		x
			>0R27 – 0R99	1 / 5 / 10	100	x		x
0805		0,125	0R05 – 0R27	5 / 10	500	x		x
			>0R27 – 0R99	1 / 5 / 10	100	x		x
1206		0,250	0R05 – 0R27	5 / 10	500	x		x
			>0R27 -- 0R99	1 / 5 / 10	100	x		x
1210		0,500	0R05 – 0R27	5 / 10	500	x		x
			>0R27 – 0R99	1 / 5 / 10	100	x		x
1218		1,000	0R02 – 0R10	5 / 10	500		x	x
			>0R10 – 0R99	1 / 5 / 10	100		x	x
2010		0,500	0R05 – 0R27	5 / 10	500		x	x
			>0R27 – 0R99	1 / 5 / 10	100		x	x
2512		1,000	0R05 – 0R27	5 / 10	500		x	x
			>0R27 – 0R99	1 / 5 / 10	100		x	x
			>0R10 – 0R99	5 / 10	100		x	x

Technical data - general:

Tecnical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	±(1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

High ohmic series

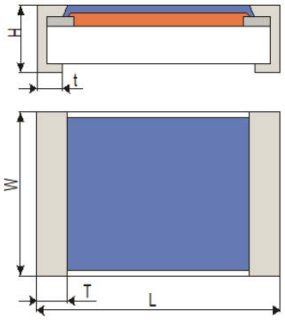
Type: CHF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Very high ohmic resistor layers
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Standard measuring voltage: 50V
- Application-specific measuring voltage acc. customer specifications available
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact -K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape acc. EN 60286-3	Blister tape acc. EN 60286-3
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CHF	- S	0805	500M	10%	250ppm/K	N	P	5 (optional)	10V
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)	Measuring voltage [V]
CHF	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	0402 to 2512	10M to 1G	1 5 20	100 250 500	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit	Variable acc. customer specifications (Standard: 50V)

High ohmic series

Type: CHF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range [1]	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	$P = \frac{U^2}{R}$	>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
0603	75		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
0805	150		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
1206	200		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
1210 / 1218	200		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x[3]	x[3]	x
			>330M - 500M	5 / 10 / 20	250	x[3]	x[3]	x
			>500M - 1G00	5 / 10 / 20	500	x[3]	x[3]	x
2010	300		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250		x	x
			>330M - 500M	5 / 10 / 20	250		x	x
			>500M - 1G00	5 / 10 / 20	500		x	x
2512	500		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250		x	x
			>330M - 500M	5 / 10 / 20	250		x	x
			>500M - 1G00	5 / 10 / 20	500		x	x

Higher resistor values on request

[1] Measuring voltage 50 V

[2] >10M to 100M TCR ±100

[3] Size 1210 card tape

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

Trimmable series

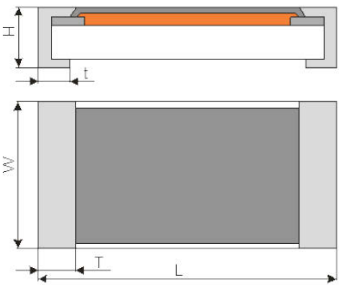
Type: CRA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Resistance area trimmable after manufacturing
- Maximum trimming factor=1,3; higher factors by reducing of U_{max} or P_{70} available
- Resistance area coated with glass passivation
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact –K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape acc. EN 60286-3	Blister tape acc. EN 60286-3
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CRA	- N	0603	10k	-20%	100ppm/K	N	P	10 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CRA	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	0402 to 2512	1R to 10M	Customer specific	50 100	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Trimmable series

Type: CRA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

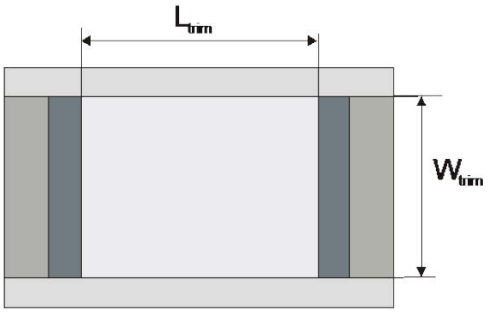
Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance* (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,063	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
0603	75	0,100	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
0805	150	0,125	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
1206	200	0,250	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
1210	200	0,500	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
1218	200	1,000	1R - 10M	-5 / -10 / -20 / -30	50 / 100		x	x
2010	300	0,500	1R - 10M	-5 / -10 / -20 / -30	50 / 100		x	x
2512	500	1,000	1R - 10M	-5 / -10 / -20 / -30	50 / 100		x	x

*Optional with tolerances of ±5%, ±10%, ±20% or ±30%

Dimensions of trimming area (in mm):

Size	L_{trim} (mm) Length		W_{trim} (mm) Width	
	Min	Max	Min	Max
0402	0,30	0,50	0,30	0,40
0603	0,50	0,90	0,35	0,55
0805	0,90	1,30	0,70	0,90
1206	1,80	2,20	1,00	1,20
1210	1,40	1,80	1,70	1,90
1218	1,40	1,80	3,60	3,80
2010	2,90	3,60	1,80	2,00
2512	4,20	5,00	1,90	2,10



Technical data - general:

Technical data	
Operating temperature range	-55°C… +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability (before trimming)	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	±(1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

Trimmable series with enhanced visual recognition

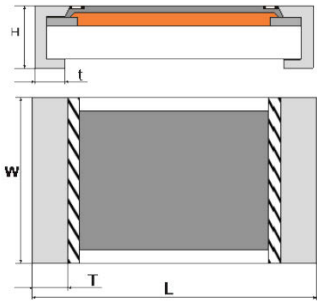
Type: CQA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Resistance area trimmable after manufacturing, clearly seperated for detecting by visual systems
- Maximum trimming factor=1,3; higher factors by reducing of U_{max} or P_{70} available
- Resistance area coated with glass passivation
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact –K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CQA	- N	0805	10R	-30%	50ppm/K	N	P	10 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CQA	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	0402 to 2512	1R to 100R	Customer specific	50 100	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Trimmable series with enhanced visual recognition

Type: CQA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

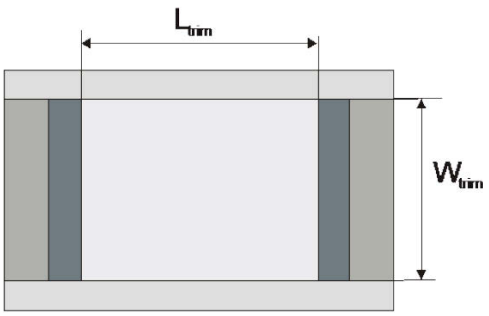
Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance* (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,063	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
0603	75	0,100	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
0805	150	0,125	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
1206	200	0,250	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
1210	200	0,500	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
1218	200	1,000	1R – 100R	-5 / -10 / -20 / -30	50 / 100		x	x
2010	300	0,500	1R – 100R	-5 / -10 / -20 / -30	50 / 100		x	x
2512	500	1,000	1R – 100R	-5 / -10 / -20 / -30	50 / 100		x	x

*optional with tolerances of ±5%, ±10%, ±20% or ±30%

Dimensions of trimming area (in mm):

Size	L_{trim} (mm) Length		W_{trim} (mm) Width	
	Min	Max	Min	Max
0402	0,30	0,50	0,30	0,40
0603	0,50	0,90	0,35	0,55
0805	0,90	1,30	0,70	0,90
1206	1,80	2,20	1,00	1,20
1210	1,40	1,80	1,70	1,90
1218	1,40	1,80	3,60	3,80
2010	2,90	3,60	1,80	2,00
2512	4,20	5,00	1,90	2,10



Technical data - general:

Technical data	
Operating temperature range	-55°C… +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability (before trimming)	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	±(1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

Pulse proof series

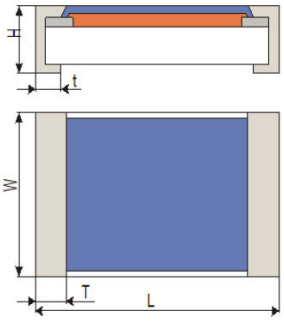
Type: CDI / CLI
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Specially pulse proof resistor layers
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Sticky contact –K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CLI	- N	1210	10k	5%	50ppm/K	N	P	10 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CDI CLI	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	0402 to 2512	1R to 10M	5 10 20	50 100	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Puls proof series

Type: CDI / CLI
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

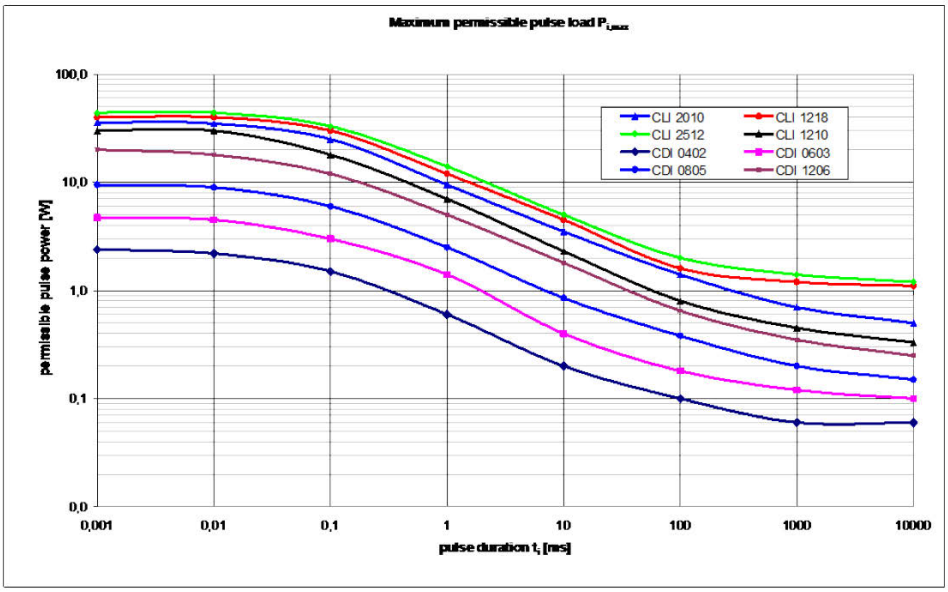
Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
CDI								
0402	50	0,063	1R - 10M	5 / 10 / 20	50 / 100	x		x
0603	75	0,100	1R - 10M	5 / 10 / 20	50 / 100	x		x
0805	150	0,125	1R - 10M	5 / 10 / 20	50 / 100	x		x
1206	200	0,250	1R - 10M	5 / 10 / 20	50 / 100	x		x
CLI								
1210	200	0,500	1R - 10M	5 / 10 / 20	50 / 100	x		x
1218	200	1,000	1R - 10M	5 / 10 / 20	50 / 100		x	x
2010	300	0,500	1R - 10M	5 / 10 / 20	50 / 100		x	x
2512	500	1,000	1R - 10M	5 / 10 / 20	50 / 100		x	x

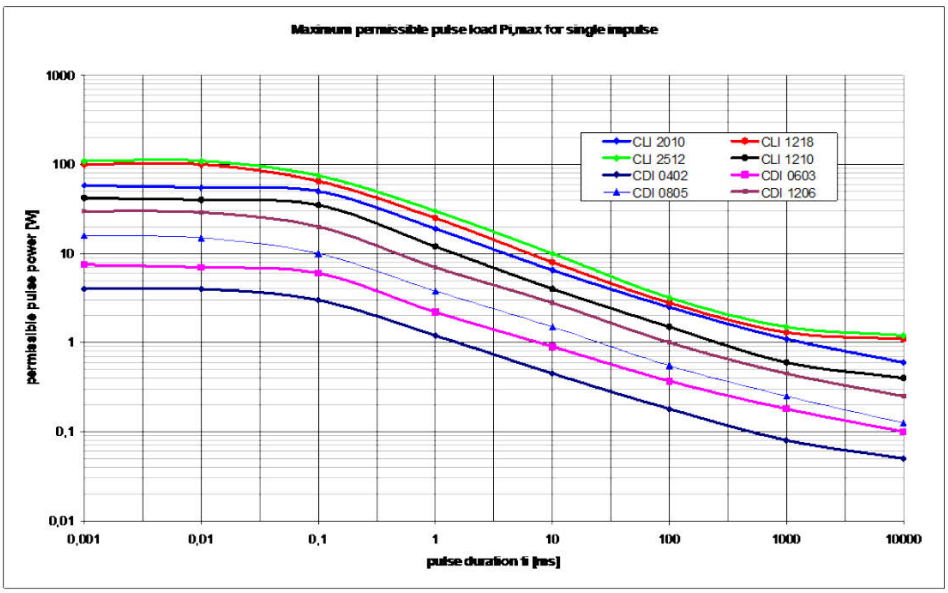
Technical data - general:

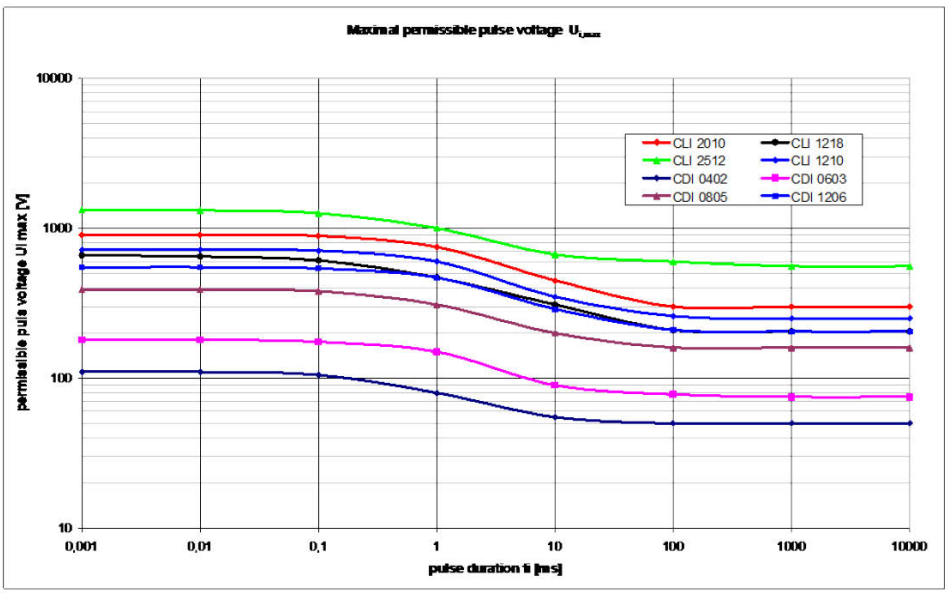
Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	±(1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

Behavior of pulse proof chip resistors (CDI / CLI) under pulse load:







Networks – Thick film series

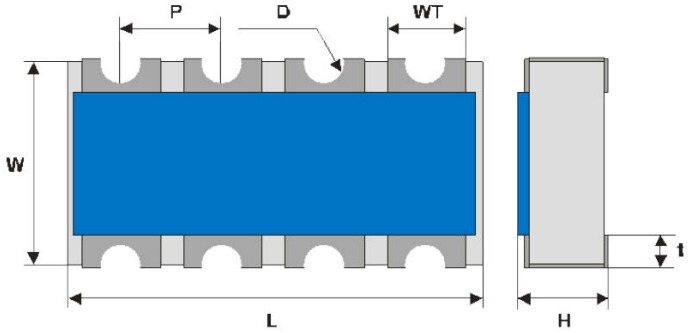
Type: CNR
Sizes: 1206-4 (4 x 0603)

Characteristics:

- Chip resistors in thick film technology
- Four isolated value-equal resistors arranged on one chip to save space
- Contact inside round surfaces of ceramic
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances (≥1%) – low temperature coefficient
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)
  - ⇒ Epoxy bondable contact –K
  - ⇒ Special corrosive gas resistant contact –S, Sulfur resistance verified according to ASTM B 809

Dimensions (in mm):

L Length	**W** Width	**H** Depth	**t** Contact back	**WT** Contact width	**P** Contact spacing	**D** Contact radius
3,2 ± 0,10	1,6 ± 0,10	0,6 ± 0,10	0,3 ± 0,10	0,5 ± 0,10	0,8	0,3



Packaging units (VPE):

Reel **Ø**	**Card tape** acc. EN 60286-3
180 mm	5 T pcs.
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

CNR	**-N**	**1206-4**	**4k7**	**1%**	**50ppm/K**	**K**	**P**	**10** (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
CNR	Standard (without add.) -N (non magnetic) -K (epoxy bondable) -S (corrosive gas resistant)	1206-4	10R to 1M	1 5	50 100	K- only with	P- Card tape S- Bulk	5 10 20

Networks – Thick film series

Type: CNR
Sizes: 1206-4 (4 x 0603)

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
1206-4	50	4 x 0,063	10R - 1M	1 / 5	50 / 100	x		x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)

Data, unless specified, acc. EN 140401-802.

Jumper in thick film technology

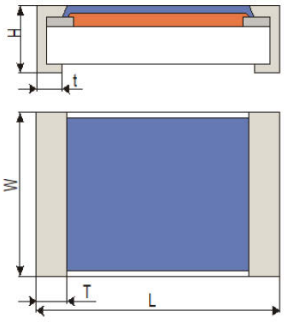
Type: CDF / CLF - Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Resistance area coated with glass and varnish passivation
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin
  - ⇒ Contact with low rest permeability -N, suitable only for reflow soldering method (The recommended storage time should not exceed 1 year after date code)

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CDF	-N	1206	0R	N	P	5 (optional)
Type	Contact	Size	R-Value	Marking	Packaging	pcs. / Reel (T pcs.)
CDF CLF	Standard (without add.) -N (non magnetic)	0402 to 2512	0R	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Jumper in thick film technology

Type: CDF / CLF - Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Max. current I_{max} (A)	Max. R-Value R_{max} (mOhm)	Insulation voltage U_{ins} (V)		Packaging		
			1 min	Continuous	P	B	S
0402	1,50	20	75	75	x		x
0603	2,00	20	100	75	x		x
0805	2,50	20	200	75	x		x
1206	3,50	20	300	75	x		x
1210	4,00	20	300	75	x		x
1218	7,00	20	300	75		x	x
2010	5,00	20	300	75		x	x
2512	7,00	20	300	75		x	x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	260°C 10s

Data, unless specified, acc. EN 140401-802.

Sulfur resistant jumper in thick film technology

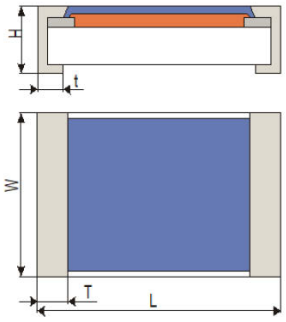
Type: CDF-S Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Resistance area coated with glass and varnish passivation
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- Special corrosive gas resistant standard contact –S, Sulfur resistance verified according to ASTM B 809
- Extended sulfur resistive contact variants on request

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

CDF	-S	1206	0R	N	P	5 (optional)
Type	Contact	Size	R-Value	Marking	Packaging	pcs. / Reel (T pcs.)
CDF	-S (corrosive gas resistant)	0402 to 2512	0R	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Sulfur resistant jumper in thick film technology

Type: CDF-S Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Max. current I_{max} (A)	Max. R-Value R_{max} (mOhm)	Insulation voltage U_{ins} (V)		Packaging		
			1 min	Continuous	P	B	S
0402	1,50	< 50	75	75	x		x
0603	2,00	< 50	100	75	x		x
0805	2,50	< 50	200	75	x		x
1206	3,50	< 50	300	75	x		x
1210	4,00	< 50	300	75	x		x
1218	7,00	< 50	300	75		x	x
2010	5,00	< 50	300	75		x	x
2512	7,00	< 50	300	75		x	x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	260°C 10s

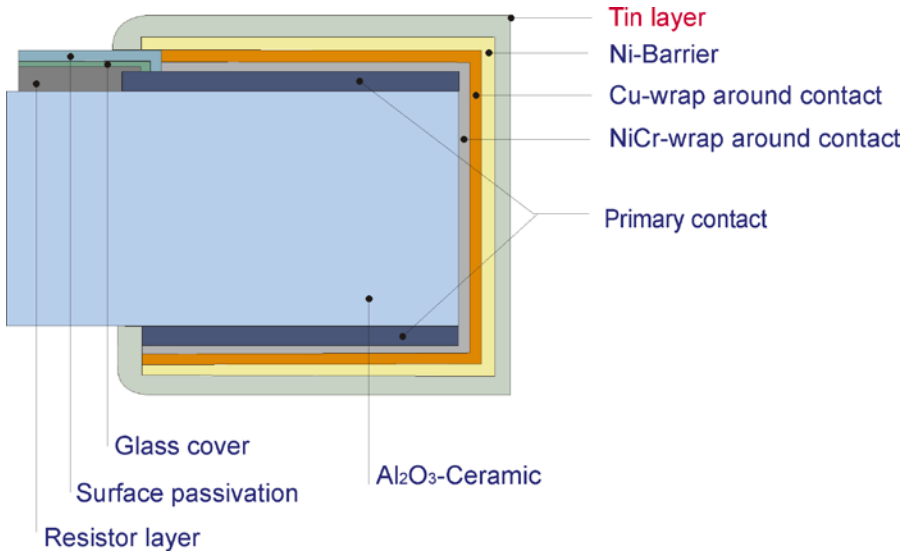
Data, unless specified, acc. EN 140401-802.

Contact variants – Thick film

All components, depending on specifications, are produced to customer request in any of the following contact variants.

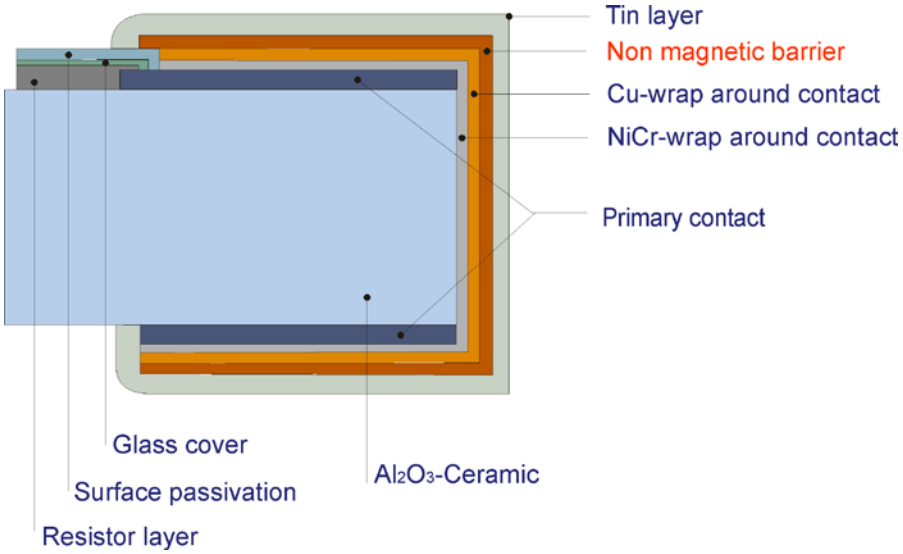
Lead-free galvanic standard contact:

- Electroplated pure tin contact



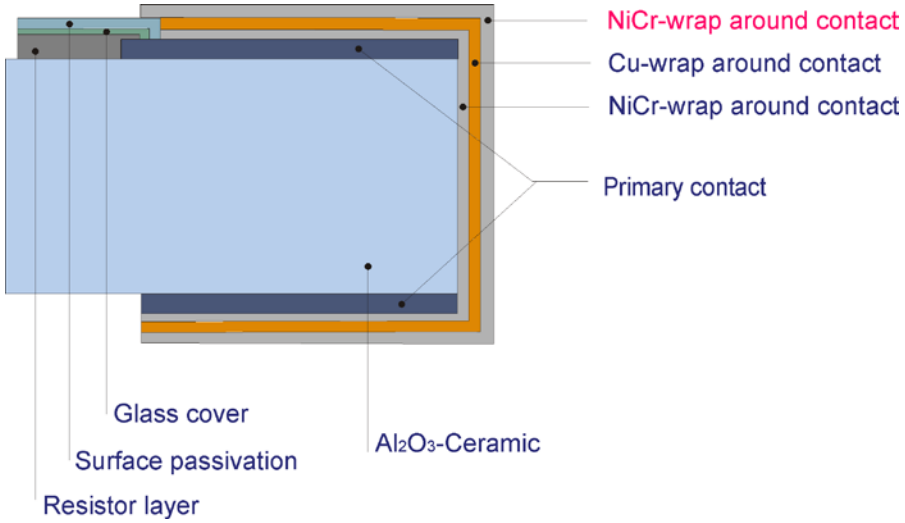
Non magnetic galvanic contact:

- Contact system without electroplated Ni-Barrier (low rest permeability)



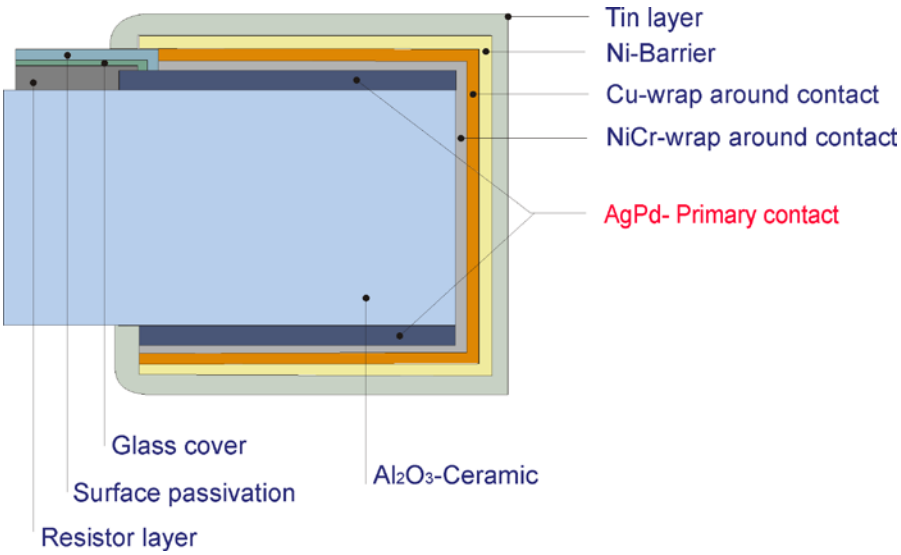
Epoxy bondable contact:

- Tin-free sputtered contact for mounting with conductive adhesives



Corrosive gas resistant contact:

- Contact system with increased resistance against sulfonamide processes



Production program / Linecard
Thin film (Metal film) - Automotive variant, AEC Q200 qualified

Thin film series - Automotive variant						AMF
Type	**Size**	**U_{max} (V)**	**P_{70} (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
						10 / 15
AMF	0603	75	0,100	100R – 56k	0,1 / 0,25 / 0,5 / 1	25
						50
						10 / 15
AMF	0805	150	0,125	100R – 130k	0,1 / 0,25 / 0,5 / 1	25
						50
						10 / 15
AMF	1206	200	0,250	100R – 180k	0,1 / 0,25 / 0,5 / 1	25
						50

Networks with circuit variants						AMA
Type	**Size**	**U_{max} (V)**	**P_{70} (W)**	**R-Range with circuit variants (R_1=R_2=R_3=R_4 / R_1=R_4 ; R_2=R_3)**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
AMA	1206-4	50	0,063 per element	100R – 25k	0,25 / 0,5 / 1	25 / 50

Jumper in thin film technology	Jumper
For sizes 0603, 0805, 1206 we offer jumpers (0R).	max. 0R020

Contact variants available for all types	**Sign**	**Characteristics**
Lead-free standard contact	AMF	Electroplated pure tin contact

Ordering information

AMF		**0603**	**10k**	**0,1%**	**10ppm/K**	**K**	**P**	**5** (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
AMF	Standard (without add.)	0603 to 1206	100R to 180K	0,1 0,25 0,5 1	10 15 25 50	K- with N- without	P- Card tape S- Bulk	Depends on size and packaging unit

Production program / Linecard
Thick film - Automotive variant, AEC Q200 qualified

Thick film series - Standard						ADF
Type	**Size**	**U_{max} (V)**	**P_{70} [1] (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
ADF	0402	50	0,063	1R – 10M	1	50 / 100
ADF	0603	75	0,100	1R – 10M	0,5 / 1	50 / 100
ADF	0805	150	0,125	1R – 10M	0,5 / 1	50 / 100
ADF	1206	200	0,250	1R – 10M	0,5 / 1	50 / 100

High power series						ALF
ALF	1210	200	0,500	1R – 10M	0,5 / 1 / 5	50 / 100
ALF	1218	200	1,000	1R – 10M	0,5 / 1 / 5	50 / 100
ALF	2010	300	0,500	1R – 10M	0,5 / 1 / 5	50 / 100
ALF	2512	500	1,000	1R – 10M	0,5 / 1 / 5	50 / 100

Low ohmic series						ANF
ANF	0402	$U = \sqrt{P*R}$	0,063	0R27 – 0R99	1 / 5 / 10	100
ANF	0603		0,100	0R05 – 0R27 0R27 – 0R99	5 / 10 1 / 5 / 10	500 100
ANF	0805		0,125			
ANF	1206		0,250			
ANF	1210		0,500			
ANF	2010		0,500			
ANF	2512		1,000			
ANF	1218		1,000	0R02 – 0R10 0R10 – 0R99	5 / 10 1 / 5 / 10	500 100

High ohmic series						AHF
AHF	0402	50	$P = \frac{U^2}{R}$	>10M – 1G [2]	from 1,0 (>330M from 5,0%)	100 / 250 (>500M TK 500)
AHF	0603	75		>10M – 1G [2]		
AHF	0805	150		>10M – 1G [2]		
AHF	1206 / 1210 / 1218	200		>10M – 1G [2]		
AHF	2010	300		>10M – 1G [2]		
AHF	2512	500		>10M – 1G [2]		

[1] For continuous operation sufficient heat dissipation must be ensured.

[2] Higher R-Values on request

Trimmable series						ARA
Type	**Size**	**U_{max} (V)**	**P_{70} (W)**	**R-Range**	**R-Tolerance (± %)**	**TCR (± ppm/K)**
ARA	0402	50	0,063	1R – 10M	Tolerance acc. customer request up to ±30% (also variable)	50 / 100
ARA	0603	75	0,100	1R – 10M		50 / 100
ARA	0805	150	0,125	1R – 10M		50 / 100
ARA	1206	200	0,250	1R – 10M		50 / 100
ARA	1210	200	0,500	1R – 10M		50 / 100
ARA	1218	200	1,000	1R – 10M		50 / 100
ARA	2010	300	0,500	1R – 10M		50 / 100
ARA	2512	500	1,000	1R – 10M		50 / 100

Production program / Linecard
Thick film - Automotive variant, AEC Q200 qualified

Trimmable series with better visual recognition						AQA
AQA	0402	50	0,063	1R – 100R	Tolerance acc. customer request up to ±30% (also variable)	50 / 100
AQA	0603	75	0,100	1R – 100R		50 / 100
AQA	0805	150	0,125	1R – 100R		50 / 100
AQA	1206	200	0,250	1R – 100R		50 / 100
AQA	1210	200	0,500	1R – 100R		50 / 100
AQA	1218	200	1,000	1R – 100R		50 / 100
AQA	2010	300	0,500	1R – 100R		50 / 100
AQA	2512	500	1,000	1R – 100R		50 / 100

Pulse proof series						ADI / ALI
ADI	0402	50	0,063	1R – 10M	5 / 10 / 20	50 / 100
ADI	0603	75	0,100	1R – 10M	5 / 10 / 20	50 / 100
ADI	0805	150	0,125	1R – 10M	5 / 10 / 20	50 / 100
ADI	1206	200	0,250	1R – 10M	5 / 10 / 20	50 / 100
ALI	1210	200	0,500	1R – 10M	5 / 10 / 20	50 / 100
ALI	1218	200	1,000	1R – 10M	5 / 10 / 20	50 / 100
ALI	2010	300	0,500	1R – 10M	5 / 10 / 20	50 / 100
ALI	2512	500	1,000	1R – 10M	5 / 10 / 20	50 / 100

Networks						ANR
ANR	1206-4	50	0,063 per element	10R – 1M	1 / 5	50 / 100

Jumper in thick film technology	Jumper
For all sizes we offer jumpers (0R).	max. 0R020

Contact variants	Sign (e.g. for ADF)	Characteristics
Lead-free standard contact	ADF	Electroplated pure tin contact

Ordering information

ADF		0603	10k	1%	50ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ADF	Standard (without add.)	0402 . . 2512	1R . to . 10M	0,5 1,0	50 100	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Thin film series - Automotive variant

Type: AMF
Sizes: 0603, 0805, 1206

Characteristics:

- Chip resistors in thin film technology
- High-precision resistor layers
- Resistance area coated with surface passivation
- AEC Q200 qualified
- Very tight tolerances (≥0,1%) - low temperature coefficient (≥10ppm/K)
- Low current noise, good pulse strength
- R-Value-Matching available
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Order quantities from 1000 pieces for <1% and <TCR 50 available by extra charge
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact Front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75

Packaging units:

Reel Ø	Card tape acc. EN 60286-3
180 mm	5 T pcs.
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

AMF		0603	10k	0,1%	10ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
AMF	Standard (without add.)	0603 . to . 1206	100R . to . 180k	0,1 0,25 0,5 1	10 15 25 50	K- with N- without	P- Card tape S- Bulk	Depends on size and packaging unit

Thin film series - Automotive variant

Type: AMF
Sizes: 0603, 0805, 1206

Technical data – depending on size:

Size	U_{max} (V)	P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0603	75	0,100	100R – 56k	0,1 / 0,25 / 0,5 /1	10	x		x
					15	x		x
					25	x		x
					50	x		x
0805	150	0,125	100R – 130k	0,1 / 0,25 / 0,5 /1	10	x		x
					15	x		x
					25	x		x
					50	x		x
1206	200	0,250	100R – 180k	0,1 / 0,25 / 0,5 /1	10	x		x
					15	x		x
					25	x		x
					50	x		x

Technical data - general:

Technical data	Automotive variant
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	± (0,05% +0,01R) at 260°C 10s
Long time stability	
Storage 155°C / 1000 h	± (0,25% +0,05R)
Endurance P_{70} / 70°C / 1000 h	± (0,25% +0,05R)
Biased humidity (1000h / 85°C / 85%)	± (0,5% +0,05R)

Data, unless specified, acc. EN 140401-801.

Networks - Thin film series - Automotive variant

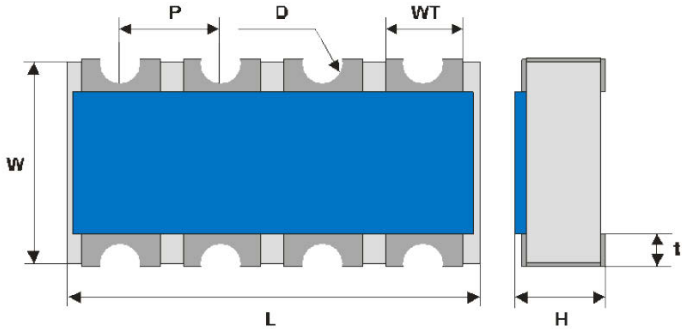
Type: AMA
Sizes: 1206-4 (4 x 0603)

Characteristics:

- Chip resistors in thin film technology
- Four isolated resistors with 2 circuit variants
- Concave contact
- Resistance area coated with surface passivation
- High stability and reliability
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

L Length	**W** Width	**H** Depth	**t** Contact back	**WT** Contact width	**P** Contact spacing	**D** Contact radius
3,2 ± 0,10	1,6 ± 0,10	0,6 ± 0,10	0,3 ± 0,10	0,5 ± 0,10	0,8	0,3



Packaging units:

Reel **Ø**	**Card tape** acc. EN 60286-3
180 mm	5 T pcs.
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

Circuit type 1								
AMA		**1206-4**	**4k7**	**1%**	**50ppm/K**	**N**	**P**	**10** (optional)
Type	Contact	Size	R-Value R1;R2;R3;R4	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
AMA	-Standard (without add.)	1206-4	100R to 25k	0,25 0,5 1	25 50	N- only without	P- Card tape S- Bulk	5 10 20

Networks - Thin film series - Automotive variant

Type: AMA
Sizes: 1206-4 (4 x 0603)

Ordering information:

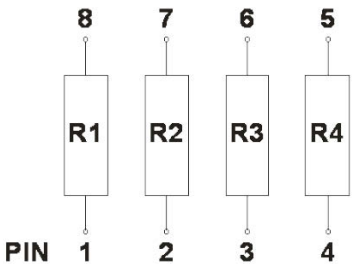
Circuit type 2									
AMA		**1206-4**	**4k7**	**6k8**	**1%**	**50ppm/K**	**N**	**P**	**10** (optional)
Type	Contact	Size	R-Value R1;R4	R-Value R2;R3	± Tolerance	± TCR	Marking	Packaging	pcs./Reel (T pcs.)
AMA	-Standard (without add.)	1206-4	100R to 25k	100R to 25k	0,25 0,5 1	25 50	N- only without	P- Card tape S- Bulk	5 10 20

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	Absolute R-Tolerance (± %)	Matching R-Tolerance (± %)	Absolute TCR (± ppm/K)	Tracking TCR (± ppm/K)	Packaging		
								P	B	S
1206-4	50	4 x 0,063	100R – 25k	± 0.25	0,1	± 25	25	x		x
1206-4	50	4 x 0,063	100R – 25k	± 0.5	0,25	± 25	25	x		x
1206-4	50	4 x 0,063	100R – 25k	± 1.0	0,5	± 25	25	x		x
1206-4	50	4 x 0,063	100R – 25k	± 0.25	0,1	± 50	50	x		x
1206-4	50	4 x 0,063	100R – 25k	± 0.5	0,5	± 50	50	x		x
1206-4	50	4 x 0,063	100R – 25k	± 1,0	0,5	± 50	50	x		x

Circuit type:

Type	AMA 1206-4
1	R1=R2=R3=R4
2	R1=R4 ; R2=R3
Ratio R_{min}/R_{max} on request	



Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,1% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (0,5% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,25% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (0,25% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (1% +0,05R)

Data, unless specified, acc. EN 140401-801.

Jumper in thin film technology - Automotive variant

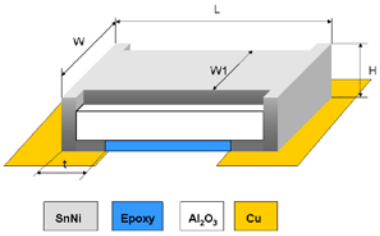
Type: AMF-Jumper
Sizes: 0603, 0805, 1206

Characteristics:

- Chip resistors in thin film technology
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Sulfur resistance verified according to ASTM B 809
- Customer specific barcodes available - also in 2D
- Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		W1 Width		H Depth		t Contact back	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0603	1,50	1,70	0,75	0,95	0,50	0,70	0,35	0,55	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,80	1,10	0,35	0,65	0,15	0,60
1206	2,90	3,35	1,45	1,75	1,00	1,30	0,35	0,65	0,15	0,75



Packaging units:

Reel Ø	Card tape acc. EN 60286-3
180 mm	5 T pcs.
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

AMF		0805	0R	N	P	5 (optional)
Type	Contact	Size	R-Value	Marking	Packaging	pcs. / Reel (T pcs.)
AMF	Standard (without add.)	0603 to 1206	0R	N- only without	P- Card tape S- Bulk	Depends on size and packaging unit

Jumper in thin film technology - Automotive variant

Type: AMF-Jumper
Sizes: 0603, 0805, 1206

Technical data – depending on size:

Size	Max. current I_{max} (A)	Max. R-Value R_{max} (mOhm)	Insulation voltage U_{ins} (V) 1 min	Insulation voltage U_{ins} (V) Continuous	Packaging P	Packaging B	Packaging S
0603	2,00	20	100	75	x		x
0805	2,50	20	200	75	x		x
1206	3,50	20	300	75	x		x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	260°C 10s

Data, unless specified, acc. EN 140401-801.

Thick film series – Standard - Automotive variant

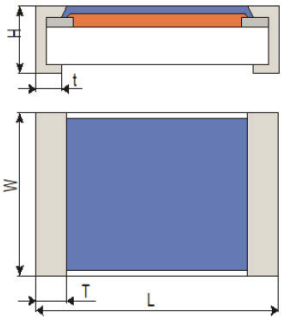
Type: ADF
Sizes: 0402, 0603, 0805, 1206

Characteristics:

- Chip resistors in thick film technology
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- AEC Q200 qualified
- Tight tolerances (≥0,5%) – low temperature coefficient
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75



Packaging units:

Reel Ø	Card tape acc. EN 60286-3
180 mm	5 T pcs. 10 T pcs. for size 0402
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

ADF		0603	10k	1%	50ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ADF	Standard (without add.)	0402 0603 0805 1206	1R to 10M	0,5 1,0	50 100	K- with (from size 0603) N- without (only size 0402)	P- Card tape S- Bulk	Depends on size and packaging unit

Thick film series – Standard - Automotive variant

Type: ADF
Sizes: 0402, 0603, 0805, 1206

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,063	1R - 10M	1,0	50 / 100	x		x
0603	75	0,100	1R - 10M	0,5 / 1,0	50 / 100	x		x
0805	150	0,125	1R - 10M	0,5 / 1,0	50 / 100	x		x
1206	200	0,250	1R - 10M	0,5 / 1,0	50 / 100	x		x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

High power series - Automotive variant

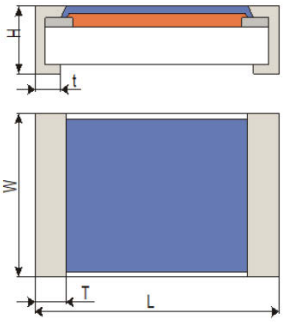
Type: ALF
Sizes: 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Special layout for high electrical load
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- AEC Q200 qualified
- Tight tolerances (≥0,5%) – low temperature coefficient (≥50ppm/K)
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs.	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

ALF		1210	100k	1%	100ppm/K	K	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ALF	Standard (without add.)	1210 to 2512	1R to 10M	0,5 1 5	50 100	K- only with	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

High power series - Automotive variant

Type: ALF
Sizes: 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
1210	200	0,50	1R - 10M	0,5 / 1 / 5	50 / 100	x		x
1218	200	1,00	1R - 10M	0,5 / 1 / 5	50 / 100		x	x
2010	300	0,50	1R - 10M	0,5 / 1 / 5	50 / 100		x	x
2512	500	1,00	1R - 10M	0,5 / 1 / 5	50 / 100		x	x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

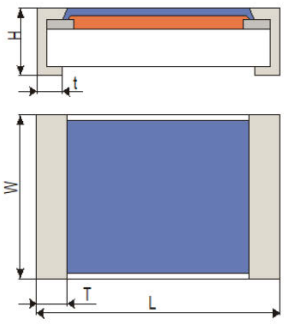
Low ohmic series - Automotive variant

Type: ANF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512
Characteristics:

- Chip resistors in thick film technology
- Very low ohmic resistor layers
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

ANF		0603	0R15	5%	100ppm/K	N	P	5 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ANF	Standard (without add.)	0402 to 2512	0R02 to 0R99	1 5 10	100 500	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Low ohmic series - Automotive variant

Type: ANF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	$U = \sqrt{P * R}$	0,063	0R27 – 0R99	1 / 5 / 10	100	x		x
0603		0,100	0R05 – 0R27	5 / 10	500	x		x
			>0R27 – 0R99	1 / 5 / 10	100	x		x
0805		0,125	0R05 – 0R27	5 / 10	500	x		x
			>0R27 – 0R99	1 / 5 / 10	100	x		x
1206		0,250	0R05 – 0R27	5 / 10	500	x		x
			>0R27 -- 0R99	1 / 5 / 10	100	x		x
1210		0,500	0R05 – 0R27	5 / 10	500	x		x
			>0R27 – 0R99	1 / 5 / 10	100	x		x
1218		1,000	0R02 – 0R10	5 / 10	500		x	x
			>0R10 – 0R99	1 / 5 / 10	100		x	x
2010		0,500	0R05 – 0R27	5 / 10	500		x	x
			>0R27 – 0R99	1 / 5 / 10	100		x	x
2512		1,000	0R05 – 0R27	5 / 10	500		x	x
			>0R27 – 0R99	1 / 5 / 10	100		x	x
			>0R10 – 0R99	5 / 10	100		x	x

Technical data - general:

Tecnical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

High ohmic series - Automotive variant

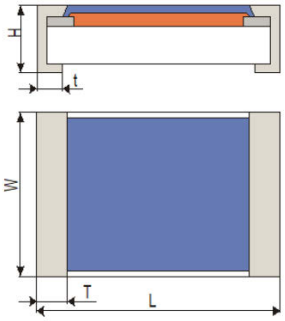
Type: AHF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Very high ohmic resistor layers
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Standard measuring voltage: 50V
- Application-specific measuring voltage acc. customer specifications available
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

AHF		0805	500M	10%	250ppm/K	N	P	5 (optional)	10V
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)	Measuring voltage [V]
AHF	Standard (without add.)	0402 to 2512	10M to 1G	1 5 20	100 250 500	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit	Variable acc. customer specifications (Standard: 50V)

High ohmic series - Automotive variant

Type: AHF
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range [1]	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	$P = \frac{U^2}{R}$	>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
0603	75		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
0805	150		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
1206	200		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x		x
			>330M - 500M	5 / 10 / 20	250	x		x
			>500M - 1G00	5 / 10 / 20	500	x		x
1210 / 1218	200		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250	x[3]	x[3]	x
			>330M - 500M	5 / 10 / 20	250	x[3]	x[3]	x
			>500M - 1G00	5 / 10 / 20	500	x[3]	x[3]	x
2010	300		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250		x	x
			>330M - 500M	5 / 10 / 20	250		x	x
			>500M - 1G00	5 / 10 / 20	500		x	x
2512	500		>10M0 - 330M	1 / 2 / 5 / 10	100[2]/ 250		x	x
			>330M - 500M	5 / 10 / 20	250		x	x
			>500M - 1G00	5 / 10 / 20	500		x	x

Higher resistor values on request

[1] Measuring voltage 50 V

[2] >10M to 100M TCR ±100

[3] Size 1210 card tape

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

Trimmable series - Automotive variant

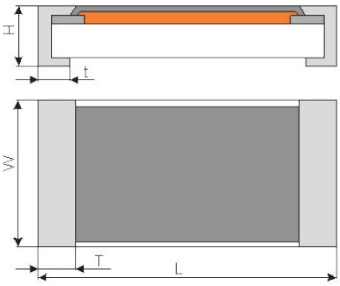
Type: ARA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Resistance area trimmable after manufacturing
- Maximum trimming factor=1,3; higher factors by reducing of U_{max} or P_{70} available
- Resistance area coated with glass passivation
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  - ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

ARA		0603	10k	-20%	100ppm/K	N	P	10 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ARA	Standard (without add.)	0402 to 2512	1R to 10M	Customer specific	50 100	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Trimmable series - Automotive variant

Type: ARA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

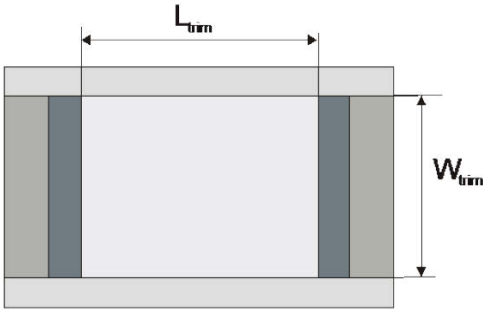
Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance* (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,063	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
0603	75	0,100	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
0805	150	0,125	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
1206	200	0,250	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
1210	200	0,500	1R - 10M	-5 / -10 / -20 / -30	50 / 100	x		x
1218	200	1,000	1R - 10M	-5 / -10 / -20 / -30	50 / 100		x	x
2010	300	0,500	1R - 10M	-5 / -10 / -20 / -30	50 / 100		x	x
2512	500	1,000	1R - 10M	-5 / -10 / -20 / -30	50 / 100		x	x

*Optional with tolerances of ±5%, ±10%, ±20% or ±30%

Dimensions of trimming area (in mm):

Size	L_{trim} (mm) Length		W_{trim} (mm) Width	
	Min	Max	Min	Max
0402	0,30	0,50	0,30	0,40
0603	0,50	0,90	0,35	0,55
0805	0,90	1,30	0,70	0,90
1206	1,80	2,20	1,00	1,20
1210	1,40	1,80	1,70	1,90
1218	1,40	1,80	3,60	3,80
2010	2,90	3,60	1,80	2,00
2512	4,20	5,00	1,90	2,10



Technical data - general:

Technical data	
Operating temperature range	-55°C… +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability (before trimming)	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

Trimmable series with enhanced visual recognition - Automotive variant

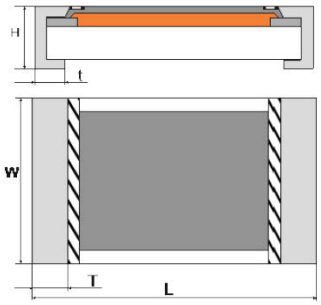
Type: AQA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Resistance area trimmable after manufacturing, clearly seperated for detecting by visual systems
- Maximum trimming factor=1,3; higher factors by reducing of U_{max} or P_{70} available
- Resistance area coated with glass passivation
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape acc. EN 60286-3	Blister tape acc. EN 60286-3
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

AQA		**0805**	**10R**	**-30%**	**50ppm/K**	**N**	**P**	**10** (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
AQA	Standard (without add.)	0402 to 2512	1R to 100R	Customer specific	50 100	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Trimmable series with enhanced visual recognition - Automotive variant

Type: AQA
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

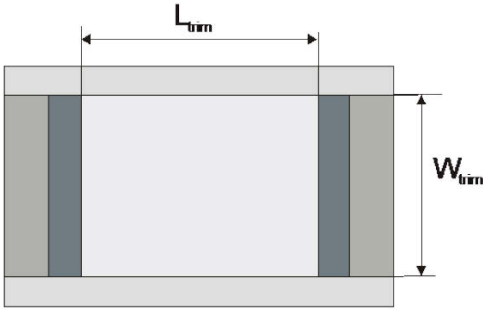
Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance* (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
0402	50	0,063	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
0603	75	0,100	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
0805	150	0,125	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
1206	200	0,250	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
1210	200	0,500	1R – 100R	-5 / -10 / -20 / -30	50 / 100	x		x
1218	200	1,000	1R – 100R	-5 / -10 / -20 / -30	50 / 100		x	x
2010	300	0,500	1R – 100R	-5 / -10 / -20 / -30	50 / 100		x	x
2512	500	1,000	1R – 100R	-5 / -10 / -20 / -30	50 / 100		x	x

*optional with tolerances of ±5%, ±10%, ±20% or ±30%

Dimensions of trimming area (in mm):

Size	L_{trim} (mm) Length		W_{trim} (mm) Width	
	Min	Max	Min	Max
0402	0,30	0,50	0,30	0,40
0603	0,50	0,90	0,35	0,55
0805	0,90	1,30	0,70	0,90
1206	1,80	2,20	1,00	1,20
1210	1,40	1,80	1,70	1,90
1218	1,40	1,80	3,60	3,80
2010	2,90	3,60	1,80	2,00
2512	4,20	5,00	1,90	2,10



Technical data - general:

Technical data	
Operating temperature range	-55°C… +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability (before trimming)	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

Pulse proof series - Automotive variant

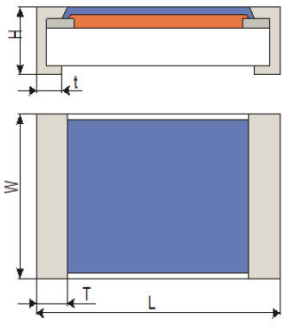
Type: ADI / ALI
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Specially pulse proof resistor layers
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

ALI		1210	10k	5%	50ppm/K	N	P	10 (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ADI ALI	Standard (without add.)	0402 to 2512	1R to 10M	5 10 20	50 100	N- only without	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Puls proof series - Automotive variant

Type: ADI / ALI
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

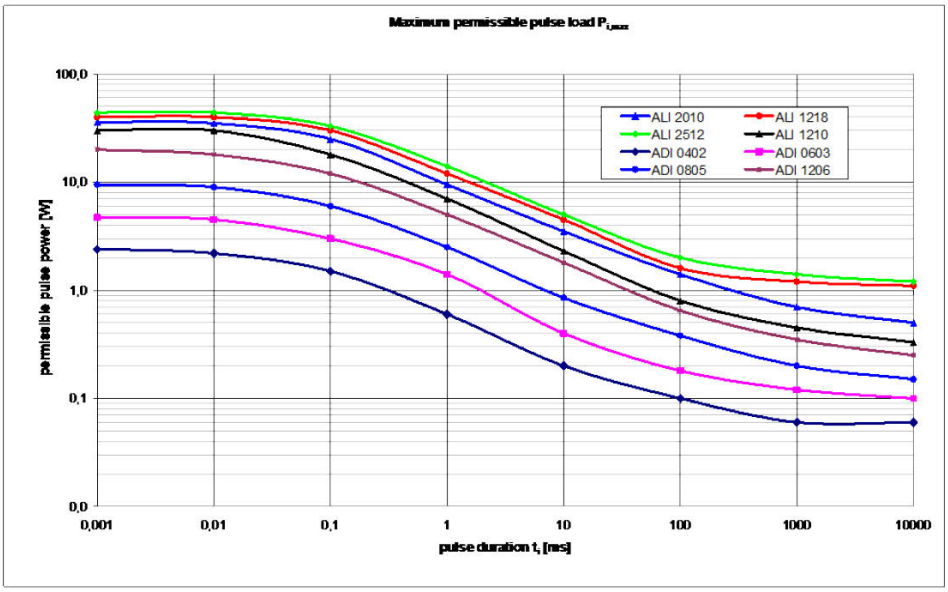
Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
ADI								
0402	50	0,063	1R - 10M	5 / 10 / 20	50 / 100	x		x
0603	75	0,100	1R - 10M	5 / 10 / 20	50 / 100	x		x
0805	150	0,125	1R - 10M	5 / 10 / 20	50 / 100	x		x
1206	200	0,250	1R - 10M	5 / 10 / 20	50 / 100	x		x
ALI								
1210	200	0,500	1R - 10M	5 / 10 / 20	50 / 100	x		x
1218	200	1,000	1R - 10M	5 / 10 / 20	50 / 100		x	x
2010	300	0,500	1R - 10M	5 / 10 / 20	50 / 100		x	x
2512	500	1,000	1R - 10M	5 / 10 / 20	50 / 100		x	x

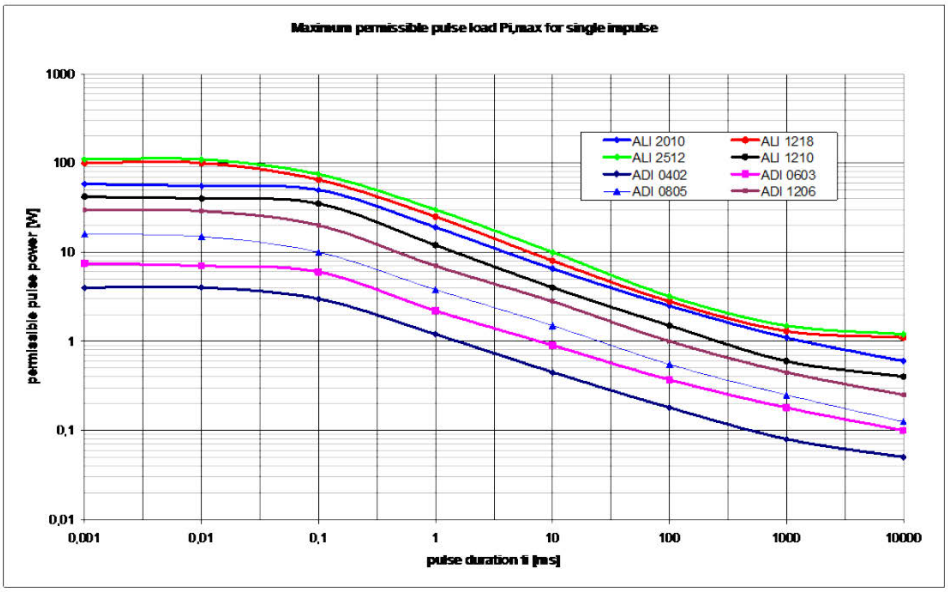
Technical data - general:

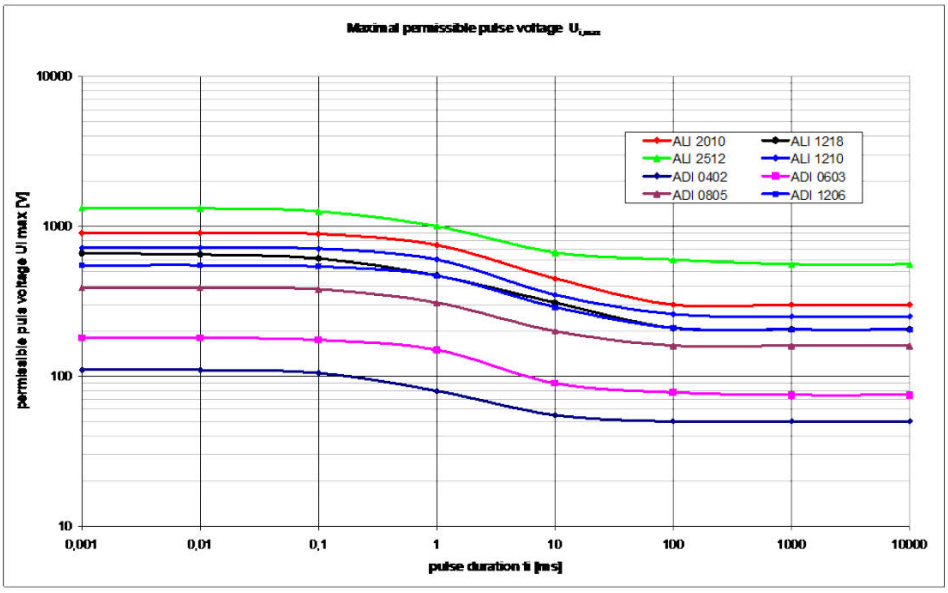
Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	±(1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	±(0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

Behavior of pulse proof chip resistors (ADI / ALI) under pulse load:







Networks – Thick film series - Automotive variant

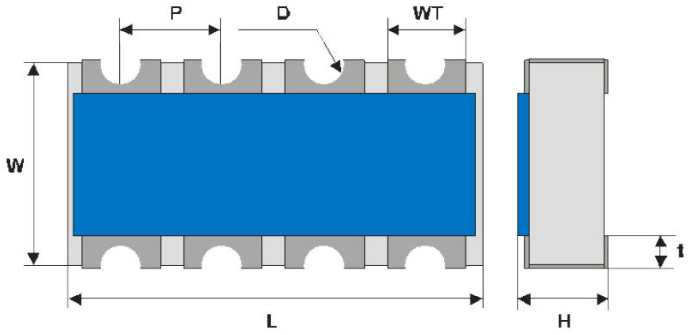
Type: ANR
Sizes: 1206-4 (4 x 0603)

Characteristics:

- Chip resistors in thick film technology
- Four isolated value-equal resistors arranged on one chip to save space
- Contact inside round surfaces of ceramic
- Resistance area coated with glass and varnish passivation
- High stability and reliability
- Tight tolerances (≥1%) – low temperature coefficient
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

L Length	**W** Width	**H** Depth	**t** Contact back	**WT** Contact width	**P** Contact spacing	**D** Contact radius
3,2 ± 0,10	1,6 ± 0,10	0,6 ± 0,10	0,3 ± 0,10	0,5 ± 0,10	0,8	0,3



Packaging units (VPE):

Reel **Ø**	**Card tape** acc. EN 60286-3
180 mm	5 T pcs.
330 mm	10 T pcs. 20 T pcs.
Samples on request	

Ordering information:

ANR		**1206-4**	**4k7**	**1%**	**50ppm/K**	**K**	**P**	**10** (optional)
Type	Contact	Size	R-Value	± Tolerance	± TCR	Marking	Packaging	pcs. / Reel (T pcs.)
ANR	Standard (without add.)	1206-4	10R to 1M	1 5	50 100	K- only with	P- Card tape S- Bulk	5 10 20

Networks – Thick film series - Automotive variant

Type: ANR
Sizes: 1206-4 (4 x 0603)

Technical data – depending on size:

Size	Nominal voltage U_{max} (V)	Load P_{70} (W)	R-Range	R-Tolerance (± %)	TCR (± ppm/K)	Packaging		
						P	B	S
1206-4	50	4 x 0,063	10R - 1M	1 / 5	50 / 100	x		x

Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Climatic category acc. EN 60068	55 / 155 / 56
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	±(0,5% + 0,05R) at 260°C 10s
Long time stability	
Storage 155°C / 1000h	± (1,0% + 0,05R)
Endurance P_{70} / 70°C / 1000h	± (0,5% + 0,05R)
Damp heat, steady state (56d / 40°C / 93%)	± (1,0% + 0,05R)
Biased humidity (1000h / 85°C / 85%)	± (2% +0,05R)

Data, unless specified, acc. EN 140401-802.

Jumper in thick film technology - Automotive variant

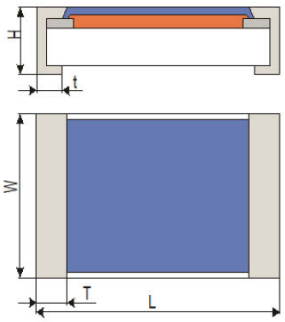
Type: ADF / ALF - Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Characteristics:

- Chip resistors in thick film technology
- Resistance area coated with glass and varnish passivation
- AEC Q200 qualified
- RoHS-conform and Halogen-free according to IEC 61249-2-21 / IPC 4101B
- Customer specific barcodes available - also in 2D
- All sizes can be manufactured with the following contact variants
  ⇒ Electroplated pure tin

Dimensions (in mm):

Size	L Length		W Width		H Depth		t Contact back		T Contact front	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
0402	0,95	1,05	0,45	0,55	0,25	0,40	0,10	0,35	0,05	0,35
0603	1,50	1,70	0,75	0,95	0,35	0,55	0,10	0,50	0,10	0,50
0805	1,85	2,15	1,10	1,40	0,35	0,65	0,15	0,60	0,15	0,60
1206	2,90	3,35	1,45	1,75	0,35	0,65	0,25	0,75	0,15	0,75
1210	3,00	3,30	2,35	2,65	0,50	0,75	0,35	0,85	0,25	0,85
1218	3,00	3,30	4,50	4,80	0,50	0,75	0,35	0,85	0,25	0,85
2010	4,80	5,20	2,30	2,70	0,50	0,75	0,35	0,85	0,25	0,85
2512	6,10	6,50	3,00	3,30	0,50	0,75	0,35	0,85	0,25	0,85



Packaging units:

Reel Ø	Card tape	Blister tape
	acc. EN 60286-3	
180 mm	5 T pcs. 10 T pcs. for size 0402	4 T pcs.
330 mm	10 T pcs. 20 T pcs.	8 T pcs. 16 T pcs.
Samples on request		

Ordering information:

ADF		1206	0R	N	P	5 (optional)
Type	Contact	Size	R-Value	Marking	Packaging	pcs. / Reel (T pcs.)
ADF ALF	Standard (without add.)	0402 to 2512	0R	K- with (from size 0603) N- without (only size 0402)	P- Card tape B- Blister tape S- Bulk	Depends on size and packaging unit

Jumper in thick film technology - Automotive variant

Type: ADF / ALF - Jumper
Sizes: 0402, 0603, 0805, 1206, 1210, 1218, 2010, 2512

Technical data – depending on size:

Size	Max. current I_{max} (A)	Max. R-Value R_{max} (mOhm)	Insulation voltage U_{ins} (V)		Packaging		
			1 min	Continuous	P	B	S
0402	1,50	20	75	75	x		x
0603	2,00	20	100	75	x		x
0805	2,50	20	200	75	x		x
1206	3,50	20	300	75	x		x
1210	4,00	20	300	75	x		x
1218	7,00	20	300	75		x	x
2010	5,00	20	300	75		x	x
2512	7,00	20	300	75		x	x

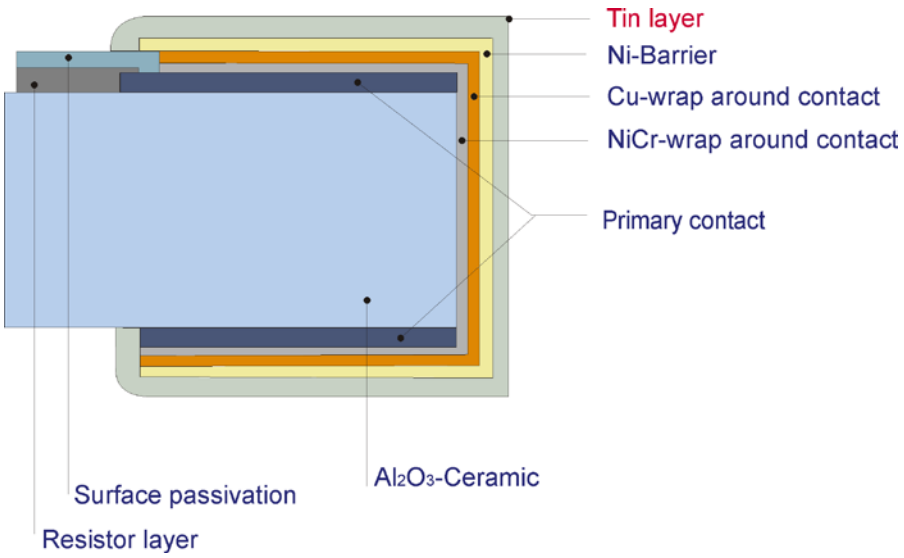
Technical data - general:

Technical data	
Operating temperature range	-55°C … +155°C
Solderability acc. EN 60068-2-58	245°C 3s
Soldering heat resistance acc. EN 60068-2-58	260°C 10s

Data, unless specified, acc. EN 140401-802.

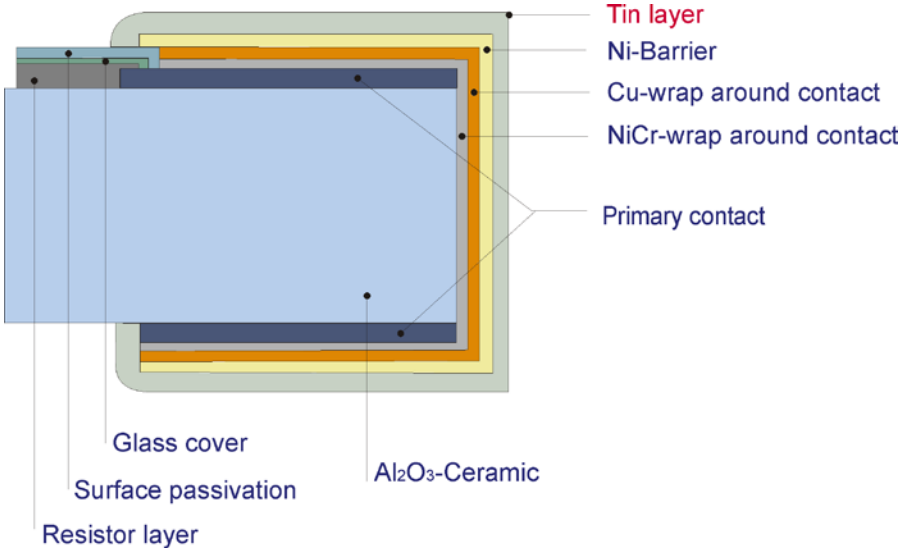
Contact variants - Automotive variant – Thin film:

- Lead free, electroplated pure tin contact



Contact variants - Automotive variant – Thick film:

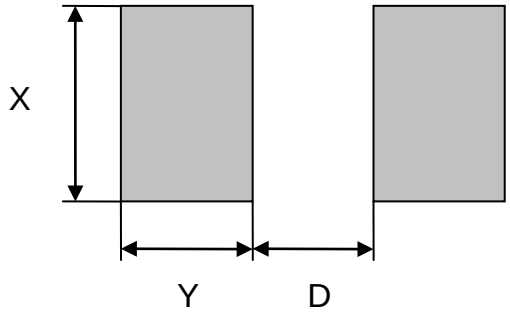
- Lead free, electroplated pure tin contact



Custom components of SMD resistors for specialized applications:

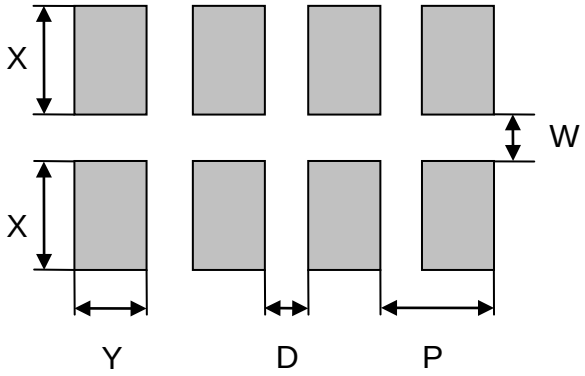
Placemats CUT-K	This is a special version of a SMD component in form of a metallized ceramic, which is used as a mounting bracket for applications.
Thin film TCR-Compensation resistor	A low ohmic range thin film chip resistor with a specific produced temperature coefficient (TCR) in the range around +2000ppm/K.
Heat-Pipe	SMD component for specific heat dissipation from the assembled print circuit board.
Matching resistors	The **Matching resistors** of the microtech GmbH electronic are specially selected resistors with R-Values which differ only +/- 0.02% from each other inside one packaging unit.

Recommended solder pad dimensions for chip resistors



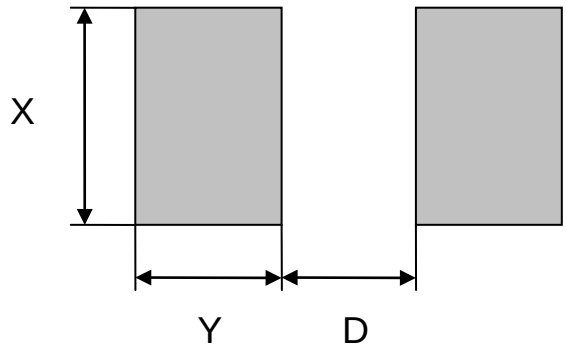
Size	X	Y	D
	in mm		
0402	0.55	0.4	0.4
0603	0.9	0.6	0.7
0805	1.4	0.8	0.9
1206	1.7	1.2	1.6
1210	2.8	1.2	1.6
1218	5.0	1.4	1.4
2010	2.8	2.0	2.5
2512	3.5	2.5	3.2

Recommended solder pad dimensions for chip resistor networks



Type	X	Y	P	W	D
	in mm				
CMA	1.0	0.45	0.8	0.8	0.35

Recommended solder pad dimensions for Platinum-Chip-Temperature sensors



Size	X	Y	D
	in mm		
0805	1.25	0.8	1.0
1206	1.5	0.8	2.0

Weights of packaging units

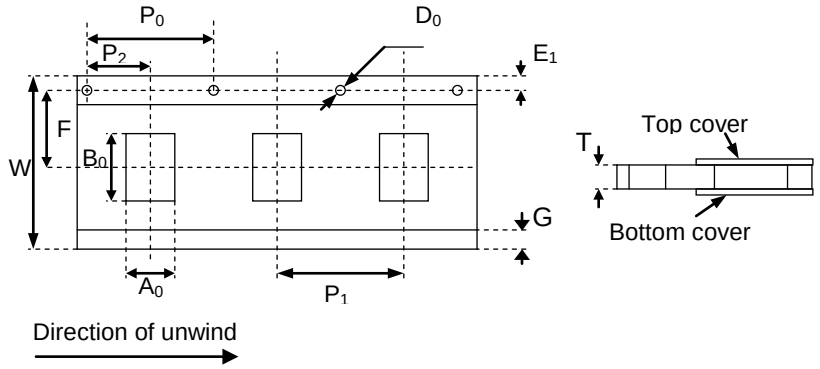
Size	Packaging unit (in pcs./Reel *)					
	5000	10000	20000	4000	8000	16000
	Weight per packaging unit (in g)					
0402	75	110	180			
0603	140	440	670			
0805	150	490	700			
1206	170	520	780			
1210	180	540	830			
1218				220	620	920
2010				220	620	920
2512				270	720	1150

* Values are only approximately

Tape dimensions acc. DIN EN 60286-3:

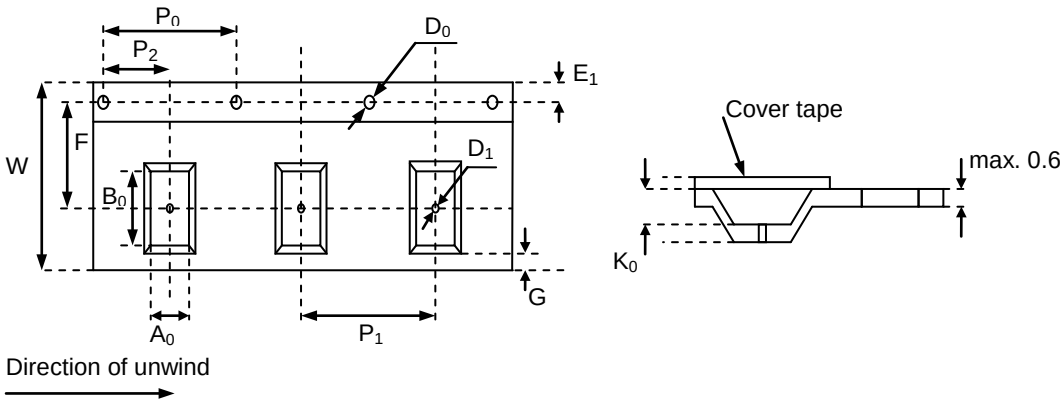
Card tape

Size	A_0	B_0	T	F	E_1	W	P_2	P_0	P_1	G	D_0
	in mm										
0402	0,70 ±0,05	1,20 ±0,05	0,37 ±0,05	3,50 ±0,05	1,75 ±0,10	8,00 ±0,30	1,00 ±0,05	4,00 ±0,10	2,00 ±0,10	min. 0,75	1,50 +0,10
0603	1,00 ±0,10	1,80 ±0,10	0,80 ±0,10	3,50 ±0,05	1,75 ±0,10	8,00 ±0,30	2,00 ±0,05	4,00 ±0,10	4,00 ±0,10	min. 0,75	1,50 +0,10
0805	1,65 ±0,20	2,40 ±0,20	0,80 ±0,10	3,50 ±0,05	1,75 ±0,10	8,00 ±0,30	2,00 ±0,05	4,00 ±0,10	4,00 ±0,10	min. 0,75	1,50 +0,10
1206	2,00 ±0,20	3,60 ±0,20	0,80 ±0,10	3,50 ±0,05	1,75 ±0,10	8,00 ±0,30	2,00 ±0,05	4,00 ±0,10	4,00 ±0,10	min. 0,75	1,50 +0,10
1210	2,80 ±0,20	3,50 ±0,20	0,80 ±0,10	3,50 ±0,05	1,75 ±0,10	8,00 ±0,30	2,00 ±0,05	4,00 ±0,10	4,00 ±0,10	min. 0,75	1,50 +0,10



Blister tape

Size	A_0	B_0	K_0	F	E_1	W	P_2	P_0	P_1	G	D_0
	in mm										
1218	3,30 ±0,10	5,10 ±0,10	0,90 ±0,10	5,50 ±0,05	1,75 ±0,10	12,00 ± 0,30	2,00 ±0,05	4,00 ±0,10	4,00 ±0,10	min. 0,75	1,50 +0,10
2010	2,95 ±0,10	5,47 ±0,10	0,80 ±0,10	5,50 ±0,05	1,75 ±0,10	12,00 ± 0,30	2,00 ±0,05	4,00 ±0,10	4,00 ±0,10	min. 0,75	1,50 +0,10
2512	3,40 ±0,10	6,70 ±0,10	0,80 ±0,10	5,50 ±0,05	1,75 ±0,10	12,00 ± 0,10	2,00 ±0,05	4,00 ±0,10	4,00 ±0,10	min. 0,75	1,50 +0,10



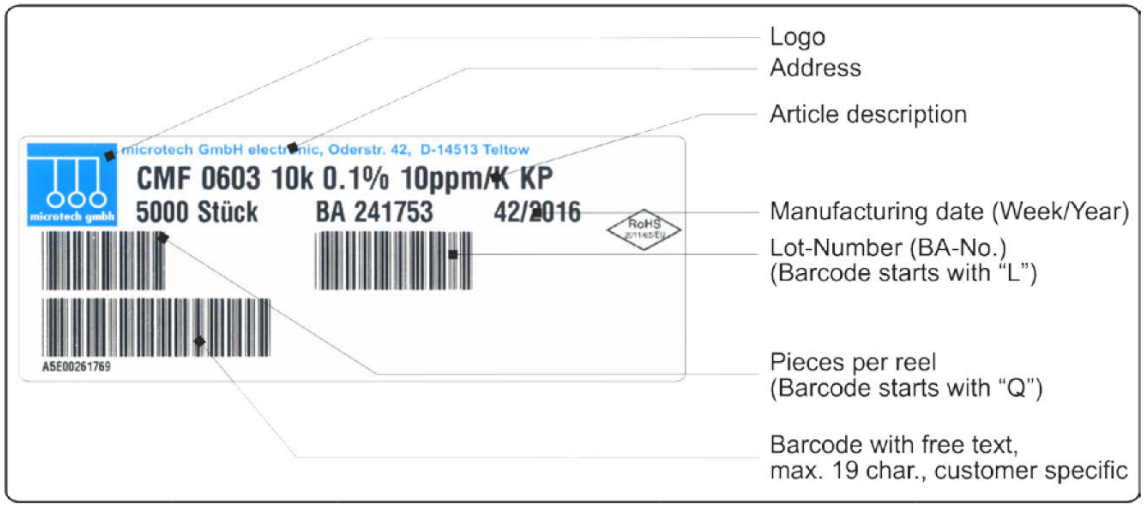
Labeling:

Our taped components will be delivered on reels without packaging around as standard. Each reel contains a label as standard as shown at the picture below.

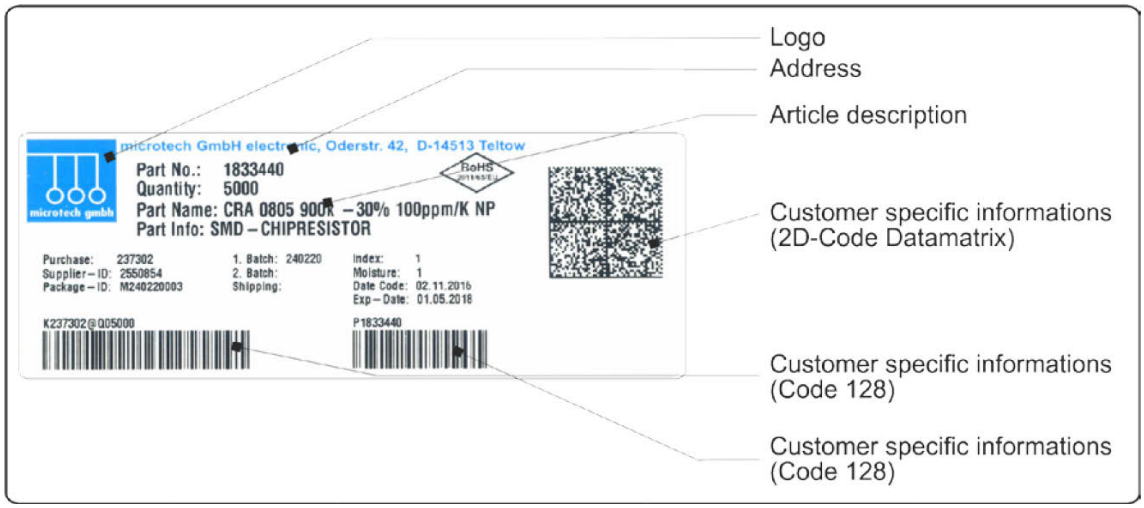
The computerized processing of supplier data by the customer is guaranteed by the using of barcodes. As standard we are using Code 39 with high-density resolution. On customer request we can realize customer specific layouts, other barcode types (acc. industrial standard), other resolutions (up to 300dpi) or other label dimensions.

With your order you can specify a custom string (max. 19 characters) for each ordering position, which will be printed by us at the (standard-)label as an extra barcode field.

Layout of standard label:



Example for a customer specific label containing barcodes of type Code 128 and Datamatrix:



Dimensions (W x H): 102mm x 38mm

Glossar und Übersetzung häufig verwendeter engl. Fachbegriffe

Fachbegriff / Abkürzung	Bedeutung / Übersetzung
Biased humidity	Umgebungs-Wärme
Blister tape	Blister-Gurt
Bulk	Schüttgut
Card tape	Papp-Gurt
Continuous operation	Dauerbetrieb
Corrosive gas resistant	Widerstandsfähigkeit gegenüber aggressiven/korrosiven Gasen
Damp heat, steady state	Feuchte Wärme
Electroplated pure tin contact	Galvanischer Reinzinn-Kontakt
Endurance	Wärmelast
Enhanced visual recognition	Erweiterte visuelle Erkennbarkeit
Epoxy bondable contact	Klebbarer Kontakt
Glass passivation	Glas-Passivierung
High ohmic	Hochohm
Jumper	Brücke
Load	Leistung
Long time stability	Langzeit-Stabilität
Low ohmic	Niederohm
Low rest permeability	Niedrige Restpermeabilität
Marking	Kennzeichnung
Nominal voltage	Nenn-Spannung
Packaging unit	Verpackungs-Einheit
Pcs. / Reel	Stück / Rolle
Pulse proof	Impulsfest
Resistance area	Widerstandsfläche
R-Range	R-Bereich
R-Tolerance	R-Toleranz
R-Value	R-Wert
Size	Baugröße
Solderability	Lötbarkeit
Soldering heat resistance	Lötwärme-Beständigkeit
Storage	Lagerung
Sufficient heat dissipation	Ausreichende Wärmeableitung
Sulfur resistance	Widerstandsfähigkeit gegenüber Sulfonamiden
TCR	TK, Temperaturkoeffizient
Temperature sensor	Temperatur-Sensor
Testpoint	Test-Kontakt
Thick film technology	Dickschicht-Technologie
Thin film technology	Dünnschicht(Metallschicht)-Technologie
Trimmable	Abgleichbar
Trimming area	Abgleich-Bereich
Trimming factor	Abgleich-Faktor
Type	Typ
Varnish passivation	Lack-Passivierung
Tape dimensions	Gurt-Abmessungen
Voltage proof	Spannungsfest

Address / Contact:

microtech GmbH electronic
Oderstraße 42
D-14513 Teltow
Germany

Registration court: Amtsgericht Potsdam HRB 560
VAT-Id: DE138456784

General Manager (CEO):
Michaela Behrendt

Phone: +49 3328 30824-0
Fax: +49 3328 30824-30

E-Mail: vertrieb@microtech-teltow.de
Internet: http://www.microtech-teltow.de

We are waiting for you:

Jens-Uwe Möller,
Sales Manager / Cust. service

Tel.: +49 3328 30824-34
Fax: +49 3328 30824-30

jumoeller@microtech-teltow.de

Andreas Baumbach,
Key Account Manager

Tel.: +49 3328 30824-19
Fax: +49 3328 30824-30

abaumbach@microtech-teltow.de

Katrin Martin, Sales

Tel.: +49 3328 30824-11
Fax: +49 3328 30824-30

kmartin@microtech-teltow.de

Julia Zielke, Sales

Tel.: +49 3328 30824-18
Fax: +49 3328 30824-30

jzielke@microtech-teltow.de

Malte Ptach, Warehouse

Tel.: +49 3328 30824-19
Fax: +49 3328 30824-30

mptach@microtech-teltow.de

Mike Heß, Purchase

Tel.: +49 3328 30824-33
Fax: +49 3328 30824-30

mhess@microtech-teltow.de

URKUNDE

Großer Preis des Mittelstandes

microtech GmbH electronic Teltow

wird mit dem Preis
der Oskar-Patzelt-Stiftung
ausgezeichnet.

Dr. Helfried Schmidt

Oskar-Patzelt-Stiftung
Vorstand

Petra Tröger

Dresden, 3. September 2016

microtech GmbH electronic
Oderstrasse 42
D-14513 Teltow
Germany

Phone: +49 3328 30824-0
Fax: +49 3328 30824-30
E-Mail: vertrieb@microtech-teltow.de
Internet: http://www.microtech-teltow.de